MAC® 5000
Resting ECG Analysis System
Operator's Manual

Software Version 008B

2020300-016 Revision A

GE Medical Systems
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For your notes

CE Marking Information

Compliance

The MAC 5000 system bears the CE mark “CE-0459”, notified body GMED, indicating its conformity with the provisions of the Council Directive 93/42/EEC, concerning medical devices and fulfills the essential requirements of Annex I of this directive.

Any other directive(s) and all the standards the product complies to are listed in the general information of the operator manual for the product following this page.

The country of manufacture can be found on the equipment labeling.

The safety and effectiveness of this device has been verified against previously distributed devices. Although all standards applicable to presently marketed devices may not be appropriate for prior devices (i.e. electromagnetic compatibility standards), this device will not impair the safe and effective use of those previously distributed devices.

Recommendations

Users should be aware of known RF sources, such as radio or TV stations and hand-held or mobile two-way radios, and consider them when installing a medical device or system.

Be aware that adding accessories or components, or modifying the medical device or system may degrade the EMI performance. Consult with qualified personnel regarding changes to the system configuration.

Operating the MAC 5000 system near radio frequency (RF) electromagnetic interference (EMI) above the conditions defined in the EMC Standard EN60601-1-2 for Radiated Immunity (field strengths above 3 volts per meter) may cause waveform distortions.

Medical Electrical Equipment needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in the accompanying service manual.

Portable and mobile RF communications equipment can affect medical electrical equipment.

The use of accessories, transducers and cables other than those specified, with the exception of transducers and cables sold by the manufacturer of the MAC 5000 system as replacement parts for internal components, may result in increased emissions or decreased immunity of theMAC 5000 system.

The MAC 5000 system should not be used adjacent to or stacked with other equipment and that if adjacent to or stacked use is necessary, the MAC 5000 system should be observed to verify normal operation in the configuration in which it will be used.

Review the AAMI Committee Technical Information Report (TIR) 18, “Guidance on Electromagnetic Compatibility of Medical Devices for Clinical/Biomedical Engineers”. This guidance document provides a means to evaluate and manage the EMI environment in the hospital.

The following actions can be taken to reduce the risk of medical device EMI and achieve EMC:

- Assess the EMC environment of the healthcare facility (e.g., identify radio transmitters in around the facility) and identify areas where critical medical devices are used (e.g., ER, ICU, CCU, NICU).
- Increase the distance between sources of EMI and susceptible devices.
- Remove the devices that are highly susceptible to EMI.
- Lower power transmitted from electrical and electronic equipment (EMI sources) under hospital control (i.e. paging systems).
- Label devices susceptible to EMI.
- Educate healthcare facility staff (nurses and doctors) to be aware of, and to recognize, potential EMI related problems.

1 Introduction

For your notes

Manual Information

Purpose

This manual contains the instructions necessary to operate the MAC 5000 system in accordance with its function and intended use.

Intended Audience

This manual is intended for the person who uses, maintains, or troubleshoots this equipment.

Revision History

Each page of the document has the document part number and revision letter at the bottom of the page. The revision letter identifies the document's update level.

Table 1. Revision History, PN 2020300-016

Revision	Date	Comment
A	24 May 2004	Initial release of manual.

Conventions

NOTE
Provides additional user information.

Styles

Bold text	Indicates keys on the keyboard, text to be entered, or hardware items such as buttons or switches on the equipment.
Italicized text	Indicates software terms that identify menu items, buttons, or options in various windows.

Ctrl+esc	Indicates a keyboard operation. A (+) sign between the names of two keys indicates that you must press and hold the first key while pressing the second key once. For example, "Press **Ctrl+esc**" means to press and hold down the **Ctrl** key while pressing the **esc** key.
<Space>	Indicates you must press the spacebar. When instructions are given for typing a precise text string with one or more spaces, the point where the spacebar must be pressed is indicated as: **<Space>**. The purpose of the < > brackets is to ensure you press the spacebar when required.
Enter	Indicates you must press the "**Enter**" or "**Return**" key on the keyboard. Do not type "enter".

Safety Information

Definitions

The terms danger, warning, and caution are used throughout this manual to point out hazards and to designate a degree or level of seriousness. Familiarize yourself with their definitions and significance.

Hazard is defined as a source of potential injury to a person.

DANGER indicates an imminent hazard which, if not avoided, will result in death or serious injury.

WARNING indicates a potential hazard or unsafe practice which, if not avoided, could result in death or serious injury.

CAUTION indicates a potential hazard or unsafe practice which, if not avoided, could result in minor personal injury or product/property damage.

NOTE provides application tips or other useful information to assure that you get the most from your equipment.

The safety information given in this manual is classified as follows.

WARNING

Accidental Spills— If liquids have entered a device, take it out of service and have it checked by a service technician before it is used again.

To avoid electric shock or device malfunction liquids must not be allowed to enter the device.

WARNING

Battery Operation— If the integrity of the protective earth conductor is in doubt, operate the unit from its battery.

WARNING

Cables— To avoid possible strangulation, route all cables away from patient's throat.

WARNING

ConnectionToMains— This is class I equipment.

The mains plug must be connected to an appropriate power supply.

WARNING

DefibrillatorPrecautions— Do not come into contact with patients during defibrillation. Otherwise, serious injury or death could result.

Patient signal inputs labeled with the CF and BF symbols with paddles are protected against damage resulting from defibrillation voltages.

To ensure proper defibrillator protection, use only the recommended cables and leadwires.

Proper placement of defibrillator paddles in relation to the electrodes is required to ensure successful defibrillation.

WARNING

Electrodes— Polarizing electrodes (stainless steel or silver constructed) may cause the electrodes to retain a residual charge after defibrillation. A residual charge will block acquisition of the ECG signal.

Whenever patient defibrillation is a possibility, use non-polarizing (silver/silver chloride construction) electrodes for ECG monitoring.

WARNING

MagneticAndElectricalInterference— Magnetic and electrical fields are capable of interfering with the proper performance of the device.

For this reason make sure that all external devices operated in the vicinity of the device comply with the relevant EMC requirements. X-ray equipment or MRI devices are possible sources of interference as they may emit higher levels of electromagnetic radiation.

WARNING

ExplosionHazard— Do NOT use in the presence of flammable anesthetics vapors or liquids.

WARNING

InterpretationHazard— Computerized interpretation is only significant when used in conjunction with clinical findings.

A qualified physician must overread all computer-generated tracings.

WARNING

Operator— Medical technical equipment such as the MAC 5000 System must only be used by qualified and trained personnel.

WARNING

ShockHazard— Improper use of this device presents a shock hazard. Strictly observe the following warnings.

Failure to do so may endanger the lives of the patient, the user, and bystanders.

When disconnecting the device from the power line, remove the plug from the wall outlet first, before disconnecting the cable from the device.

Otherwise there is a risk of coming in contact with line voltage by inadvertently introducing metal parts in the sockets of the power cord.

Devices may be connected to other devices or to parts of systems only after making certain that there is no danger to the patient, the operators, or the environment as a result. Standards IEC 60601-1-1/EN60601-1-1 must be complied with in all cases.

WARNING

SiteRequirements— Do not route cables in a way that they may present a stumbling hazard.

For safety reasons, all connectors for patient cables and leadwires are designed to prevent inadvertent disconnection, should someone pull on them.

For devices installed above the patient, adequate precautions must be taken to prevent them from dropping on the patient.

WARNING

Treadmills— Avoid rapid changes in treadmill speed and/or grade during a stress test.

CAUTION

Accessories(Supplies)— To ensure patient safety, use only parts and accessories manufactured or

recommended by GE Medical Systems Information Technologies.

Parts and accessories used must meet the requirements of the applicable IEC 60601 series safety standards and essential performance standards, and/or the system configuration must meet the requirements of the IEC 60601-1-1 medical electrical systems standard.

CAUTION

Proper Leadwire Connection — Improper connection will cause inaccuracies in the ECG.

Trace each individual leadwire from its acquisition module label to the colored connector and then to the proper electrode to ensure that it is matched to the correct label location.

CAUTION

Accessories (Equipment) — The use of ACCESSORY equipment not complying with the equivalent safety requirements of this equipment may lead to a reduced level of safety of the resulting system.

Consideration relating to the choice shall include:

Use of the accessory in the PATIENT VICINITY; and

Evidence that the safety certification of the ACCESSORY has been performed in accordance to the appropriate IEC 60601-1 and/or IEC 60601-1-1 harmonized national standard.

CAUTION

Battery Power — If a device equipped with an optional battery pack will not be used or not be connected to the power line for a period of over six months, remove the battery.

CAUTION

BeforeInstallation— Compatibility is critical to safe and effective use of this device. Please contact your local sales or service representative prior to installation to verify equipment compatibility.

CAUTION

Disposables— Disposable devices are intended for single use only. They should not be reused as performance may degrade or contamination could occur.

CAUTION

Disposal— At the end of its service life, the product described in this manual, as well as its accessories, must be disposed of in compliance with local, state, or federal guidelines regulating the disposal of such products.

If you have questions concerning disposal of the product, please contact GE Medical Systems Information Technologies or its representatives.

CAUTION

EquipmentDamage— Devices intended for emergency application must not be exposed to low temperatures during storage and transport to avoid moisture condensation at the application site.

Wait until all moisture has vaporized before using the device.

CAUTION

Electric Shock— To reduce the risk of electric shock, do NOT remove cover (or back).

Refer servicing to qualified personnel.

CAUTION

Operator— Medical technical equipment such as this electrocardiograph system must only be used by persons who have received adequate training in the use of such equipment and who are capable of applying it properly.

CAUTION

Power Requirements — Before connecting the device to the power line, check that the voltage and frequency ratings of the power line are the same as those indicated on the unit's label. If this is not the case, do not connect the system to the power line until you adjust the unit to match the power source.

In the U.S.A., if the installation of this equipment will use 240V rather than 120V, the source must be a center-tapped, 240V, single-phase circuit.

This equipment is suitable for connection to public mains as defined in CISPR 11.

CAUTION

Restricted Sale— U.S. federal law restricts this device to sale by or on the order of a physician.

CAUTION

Serviceable Parts— This equipment contains no user serviceable parts. Refer servicing to qualified service personnel.

CAUTION

Supervised Use — This equipment is intended for use under the direct supervision of a licensed health care practitioner.

Classification

The unit is classified, according to IEC 60601-1, as:

Type of protection against electrical shock	Class I internally powered equipment
Degree of protection against electrical shock	Type CF defibrillation-proof applied part
Degree of protection against harmful ingress of water	Ordinary Equipment (enclosed equipment without protection against ingress of water)
Degree of safety of application in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide	Equipment not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide
Method(s) of sterilization or disinfection recommended by the manufacturer	Not applicable
Mode of operation	Continuous operation

Underwriters Laboratories, Inc.

4P41

Medical Equipment
With respect to electric shock, fire and mechanical hazards only in accordance with UL 2601-1, and CAN/CSA C22.2 NO. 601.1.

Legal Notice

Our equipment contains several fields which can be filled in before performing an ECG. Some of these fields must be filled in before performing an exam, some are optional and therefore left to the user to assess whether they are needed to perform the exam. A field *RACE* is one of these optional fields. It has been acknowledged by the medical profession as useful to analyze some pathologies. You should be aware that, in some jurisdictions, the processing of data revealing an individual's racial origin is subject to legal requirements, such as obtaining the patient's prior consent. If you elect to collect this type of data, it is your responsibility to ensure that you comply with all applicable legal requirements.

Responsibility of the Manufacturer

GE Medical Systems *Information Technologies* is responsible for the effects of safety, reliability, and performance only if:

- Assembly operations, extensions, readjustments, modifications, or repairs are carried out by persons authorized by GE Medical Systems *Information Technologies*.
- The electrical installation of the relevant room complies with the requirements of the appropriate regulations.
- The equipment is used in accordance with the instructions for use.

General Information

Intended Use

The intended use of this device is to record ECG signals from surface ECG electrodes. This device can record, analyze, print, and store electrocardiographic information from adult and pediatric populations.

This data can then be computer analyzed with various algorithms such as interpretive ECG and signal averaging for presentation to the user.

This device is intended for use under the direct supervision of a licensed health care practitioner.

This device is not intended for use with high frequency surgical units. Disconnect the patient from the device before using the high frequency surgical unit.

This equipment uses a computerized ECG analysis program which can be used as a tool in ECG tracing interpretation. It is recommended that all ECGs are confirmed by a qualified physician or cardiologist.

To ensure accuracy, only use printed tracings and not the display for physician interpretation.

This equipment will not cause abnormal operation of a patient's pacemaker or other electronic stimulator.

The Acute Cardiac Ischemia–Time Insensitive Predictive Instrument (ACI-TIPI) Option is intended to be used in a hospital or clinical environment by competent health professionals. ACI-TIPI uses recorded ECG data to produce a numerical score which is the predicted probability of acute cardiac ischemia. Like any computer-assisted ECG interpretation program, the GE Medical Systems *Information Technologies* ACI-TIPI evaluation and probability score is intended to supplement, not substitute for, the physician's decision process. It should be used in conjunction with knowledge of the patient's history, the results of a physical examination, the ECG tracing, and other clinical findings.

ACI-TIPI is intended for adult patient populations.

This system is not intended to be used as a vital signs physiological monitor.

Recording ECGs During Defibrillation

This equipment is protected against the effects of cardiac defibrillator discharge to ensure recovery, as required by test standards.

The patient signal input of the acquisition module is defibrillation-proof. Therefore, it is not necessary to remove the ECG electrodes prior to defibrillation.

When using stainless steel or silver electrodes a defibrillator discharge current may cause the electrodes to retain a residual charge causing a polarization or dc offset voltage. This electrode polarization will block acquisition of the ECG signal. To avoid this condition, use non-polarizing electrodes (which will not form a dc offset voltage when subjected to a dc current) such as silver/silver-chloride types if there is a situation where there is a likelihood that a defibrillation procedure will be necessary.

If polarizing electrodes are used, we recommend disconnecting the leadwires from the patient before delivering the shock.

Electrode defibrillation recovery is the ability of the electrode to allow the ECG trace to return after defibrillation. We recommend using non-polarizing disposable electrodes with defibrillation recovery ratings as specified in AAMI EC12 3.2.2.4. (MMS P/N 9623-105 Silver MacTrodes, MMS spec. TP9623-003). AAMI EC12 requires that the polarization potential of an electrode pair does not exceed 100mV, 5 seconds after a defibrillation discharge.

Accuracy Of the Input Signal Reproduction

- Overall System Error is tested using the method described in AAMI EC11 3.2.7.1. Overall System Error is +5%.
- Frequency Response is tested using the method described in AAMI EC11 3.2.7.2 methods A and D.

Modulating Effects in Digital Systems

This device uses digital sampling techniques that may produce some variation in amplitudes of Q, R, and/or S waves from one heart beat to the next, which may be particularly noticeable in pediatric recordings. If this phenomenon is observed, the clinician should be aware that the origin of amplitude variations is not entirely physiologic. For measuring voltages of Q, R, and S waves, it is advisable to use the QRS complexes with the largest deflection of the particular waves.

Installation and Connection

If the installation of this equipment, in the USA, will use 240 V rather than 120 V, the source must be a center-tapped, 240 V, single-phase circuit.

Contact GE Medical Systems *Information Technologies* for information before connecting any devices to this equipment not recommended in this manual.

Parts and Accessories

To ensure patient safety, use only parts and accessories manufactured or recommended by GE Medical Systems *Information Technologies*.

Parts and accessories used must meet the requirements of the applicable IEC 601 series safety standards, and/or the system configuration must meet the requirements of the IEC 60601-1-1 medical electrical systems standard.

The use of ACCESSORY equipment not complying with the equivalent safety requirements of this equipment may lead to a reduced level of safety of the resulting system. Consideration relating to the choice shall include:

- use of the accessory in the PATIENT VICINITY; and
- evidence that the safety certification of the ACCESSORY has been performed in accordance to the appropriate IEC 60601-1 and/or IEC 60601-1-1 harmonized national standard.

Equipment Symbols

	Type BF equipment. The acquisition module is protected from defibrillation shocks.
	Alternating current.
	Equipotential.
	Charge the battery. The flashing amber LED next to this symbol indicates you must connect the system to AC power to re-charge the battery.
	Do NOT throw the battery into the garbage.
	Recycle the battery.

	Consult accompanying documents.
	This position of the switch removes battery power from the equipment.
	Classified with respect to electric shock, fire, mechanical, and other specified hazards only in accordance with UL 2601-1, CAN/CSA C22.2 No. 601-1, CAN/CSA C22.2 No. 601-2-25, EN 60601-2-25, EN 60601-1-1, IEC 60601-1-2: 2001.
	To reduce the risk of electric shock, do NOT remove cover (or back). Refer servicing to qualified personnel.
	098A, 096A, 108A, 101A, 102A, 103A, 100A, 181A, 099A

Service Information

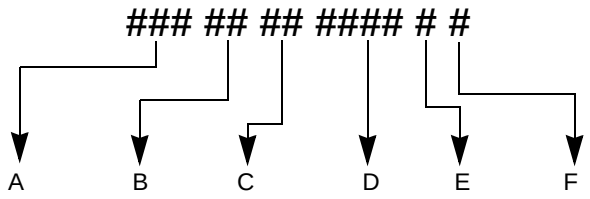
Service Requirements

Refer equipment servicing to GE Medical Systems *Information Technologies* authorized service personnel only. Any unauthorized attempt to repair equipment under warranty voids that warranty.

It is the user's responsibility to report the need for service to GE Medical Systems *Information Technologies* or to one of their authorized agents.

Equipment Identification

Every GE Medical Systems *Information Technologies* device has a unique serial number for identification. The serial number appears on the device label



A	[1]Product Code
B	Year Manufactured (00-99) 00 = 2000 01 = 2001 02 = 2002 (and so on)
C	Fiscal Week Manufactured
D	Production Sequence Number

E Manufacturing Site

F Miscellaneous Characteristic

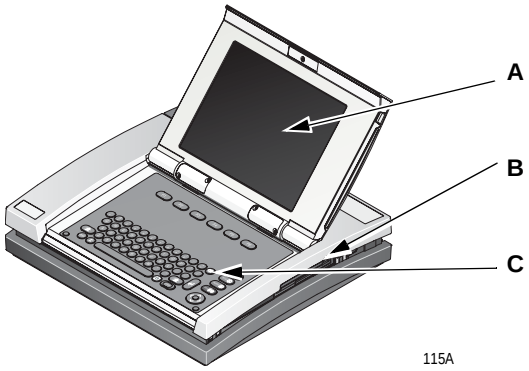
1. The product code for MAC 5000 systems is *AAY*.

2 Equipment Overview

For your notes

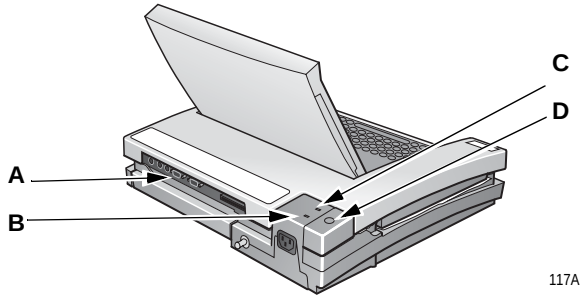
Equipment Description

Front View



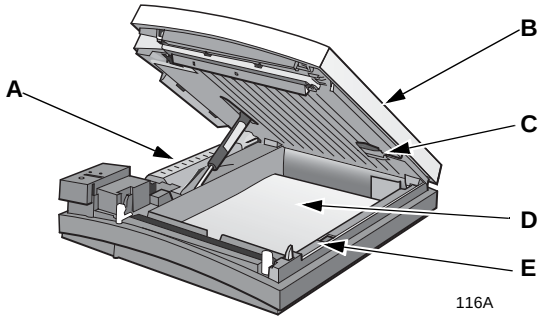
	Name	Description
A	display screen	View the waveform and text data.
B	disk drive slot	Insert a diskette to store ECG orders or recorded ECG data.
C	keyboard	Press the keyboard keys to control the system or to enter data.

Back View



	Name	Description
A	back panel connectors	Connect peripheral devices here.
B	green AC power light	Indicates the system is connected to AC power.
C	amber battery light	Indicates the battery is re-charging.
D	internal access button	Press to open the system to change paper or the battery.

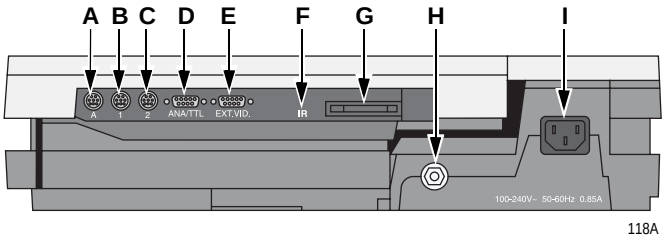
Internal View



	Name	Description
A	battery	Recharge when the battery icon flashes onscreen.
B	writer door	Open to replace paper or the battery.
C	acquisition module connector	Connect the acquisition module cable here.
D	paper tray	Place paper here.
E	*STD* or *A4*	Indicates the size of paper (standard or A4) the tray holds.

Connectors

Back Panel



118A

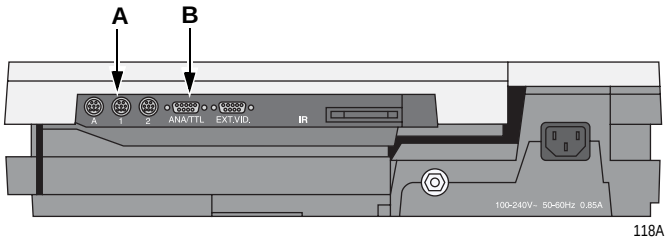
WARNING

LeakageCurrent— Keep leakage current within acceptable limits when connecting auxiliary equipment to this device.

Total system leakage current must not exceed 100 microamperes.

	Name	Description
A	**A**	Connect an optional card reader or optional bar code reader.
B	**1**	Connect a GE Medical Systems *Information Technologies* KISS pump.
C	**2**	Connect a local transmission cable, serial line, modem, or client bridge (wireless option).
D	**ANA/TTL**	Connect a device requiring analog data or TTL trigger.
E	**EXT.VID.**	Connect an external video display.
F	**IR**	Point at a MAC 5000 or MUSE CV system's **IR** transceiver to transmit or receive ECG data.
G	card slot	Insert the system card into this slot to run the system.
H	ground lug	Connect non-grounded peripheral devices to ensure equipotential.
I	main AC power	Insert the main AC power cable.

Back Panel (Exercise Option)



118A

WARNING

LeakageCurrent— Keep leakage current within acceptable limits when connecting auxiliary equipment to this device.

Total system leakage current must not exceed 100 microamperes.

	Name	Description
A	**1**	Connect a T2000 treadmill or external blood pressure device cable to this port.
B	**ANA/TTL**	Connect an analog treadmill, ergometer cable or TTL trigger to this port.

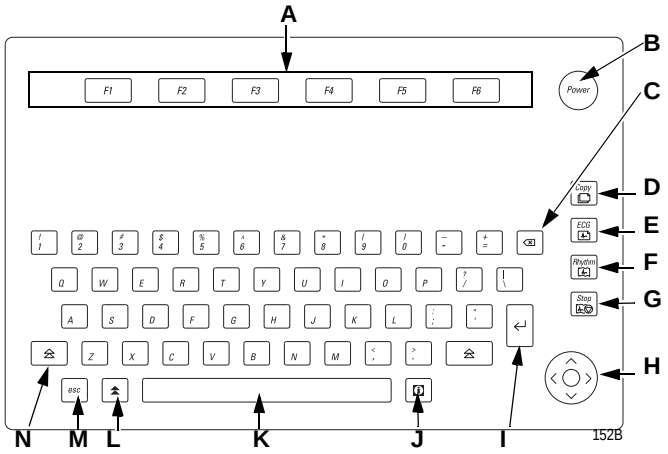
NOTE

Ergoline bicycle ergometers require connections to both ports.

Keyboard

NOTE

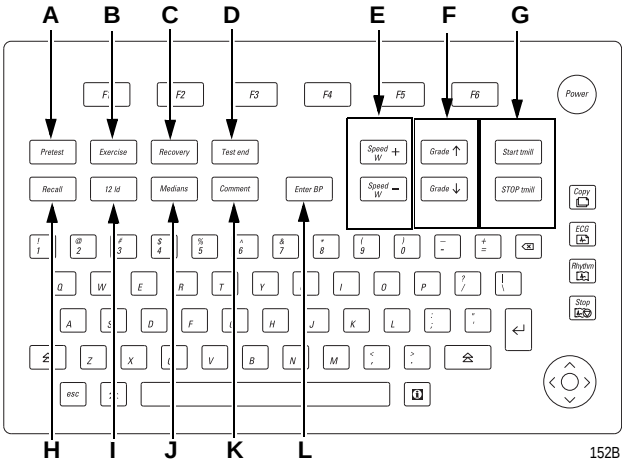
Your keyboard may be slightly different than that shown.



	Name	Description
A	function keys	Selects screen menu functions.
B	**Power**	Powers the system on or off.
C	delete	Erases typed characters.
D	**Copy**	Prints another ECG report.
E	**ECG**	Acquires an ECG. Press to acquire a 12SL resting ECG, including measurements and interpretation.
F	**Rhythm**	Prints continuous ECG data. This data cannot be stored or transmitted.
G	**Stop**	Stops the writer from printing.
H	arrow pad	Moves the cursor left, right, up, or down. Press the center to select a highlighted menu or screen item.
I	return	Enters information into the system. Throughout the manual, this key is referred to as “the return key.”
J	information	Provides additional user information.
K	space bar	Adds a space between typed characters or highlights screen items.
L	option	Used to create special characters on non-English keyboards.
M	**esc**	Returns you to a previous menu.
N	shift	Creates a capital letter. Press shift + **p** to type a capital **P**.

Keyboard–Exercise Test Keys (Option)

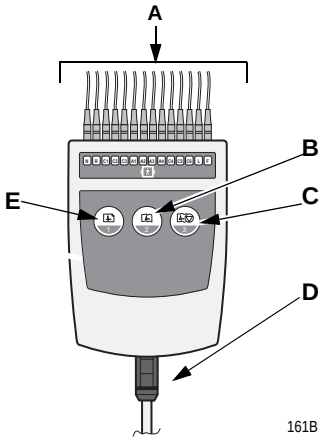
Your keyboard may be slightly different than that shown.



	Name	Description
A	**Pretest**	Press to advance to the pretest phase*.
B	**Exercise**	Press to advance to the exercise phase*.
C	**Recovery**	Press to advance to the recovery phase*.
D	**Test end**	Press and hold to end the test and start the test end phase.
E	**Speed W+/–**	Press to manually change the belt speed or ergometer load.
F	**Grade** up/down	Press to change the elevation of the treadmill belt.
G	**Start/STOP tmill**	Press to start or stop the treadmill during the test.
H	**Recall**	Press to print a 10-second delayed recall report.
I	**12 ld**	Press to print a 12 lead report (10 seconds of acquired data).
J	**Medians**	Press to print a medians report.
K	**Comment**	Press to enter comments about the test. Comments are printed on many of the final reports.
L	**Enter BP**	Press to enter BP readings or to trigger a reading from an external device.

*Or advance to next stage within the selected phase.

Acquisition Module



WARNING

Burn Protection— To ensure defibrillator protection and protection against high-frequency burns, use only the CAM-14 acquisition module with this equipment.

Otherwise, serious injury could result.

CAUTION

Proper Leadwire Connection— Improper connection will cause inaccuracies in the ECG.

Trace each individual leadwire from its acquisition module label to the colored connector and then to the proper electrode to ensure that it is matched to the correct label location.

	Name	Description
A	leadwires	Attach to the patient's electrodes. The acquisition module uses either 10 or 14 leadwires.
B	rhythm button	Press to print a rhythm strip.
C	stop writer button	Press to stop the writer from printing.

	Name	Description
D	acquisition module cable	Insert into the system's internal acquisition module connector.
E	ECG button	Press to record an ECG.

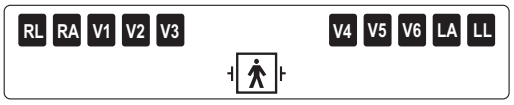
NOTE

If you enable the *Preview before analysis* function, press (E) to view the data. Then, either press (E) again to analyze the data or press (C) to discard the data.

Leadwire Labels

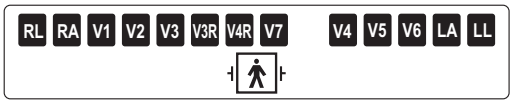
One of the following leadwire labels may appear on the acquisition module.

10 Leadwire AHA



14 Leadwire AHA

13 Leadwire AHA Pediatric



10 Leadwire IEC

204B

14 Leadwire IEC

13 Leadwire IEC Pediatric

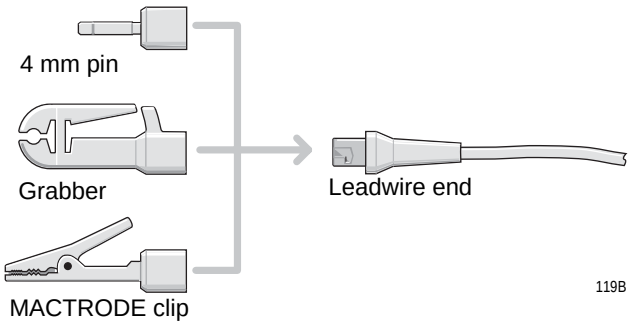
14 Leadwire AHA AUX

14 Leadwire IEC AUX

205B

Leadwire Adapters

The MULTI-LINK leadwires require an adapter to connect to an electrode.


4 mm pin
Grabber
MACTRODE clip
Leadwire end
119B

Getting Started

Prepare the Equipment for Use

Modem Option

See the MAC 5000 Field Service Manual for information about mounting and connecting the modem option.

MobileLink Wireless Option

See the MobileLink Installation and Troubleshooting Guide for information about mounting, configuring, and connecting the wireless option.

Connect External Devices (Exercise Option)

Your MAC 5000 system can connect at port **1** with the following devices:

- GE Medical Systems *Information Technologies* Series T2000 treadmills,
- SunTech Tango blood pressure device,
- Colin STBP-780 blood pressure device, or
- Ergoline 900/900L integrated blood pressure device.

NOTE

Before using external devices the MAC 5000 must be properly set up (see Chapter 14, "System Setup") and exercise protocols must be properly defined (see Chapter 7, "Editing Protocols").

Your MAC 5000 system can connect at the **ANA/TTL** port with the following devices:

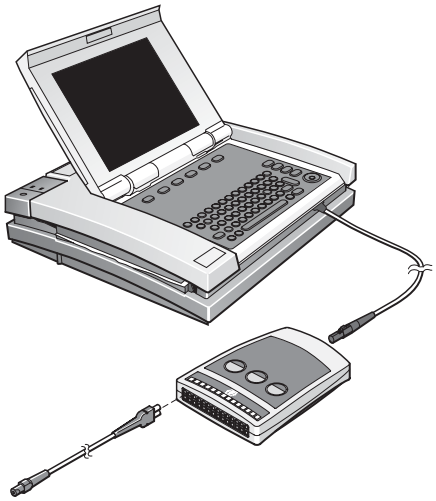
- The Ergoline 800 ergometer.
- The Ergoline 900 ergometer.
- The Lode ergometer.

NOTE

Other bicycle ergometers and treadmill models with an analog port can be connected to the analog output of the MAC 5000.

A TTL QRS trigger signal for external devices can be connected to the **ANA/TTL** port.

Connect the Acquisition Module Cables



Plug the cables into the front of the acquisition module. Refer to "Acquisition Module" on page 2-9 for more information.

Insert Disk into Disk Drive

Insert a disk with enough available capacity into the disk drive before using the device. Use a computer to check the contents/available capacity of a disk.

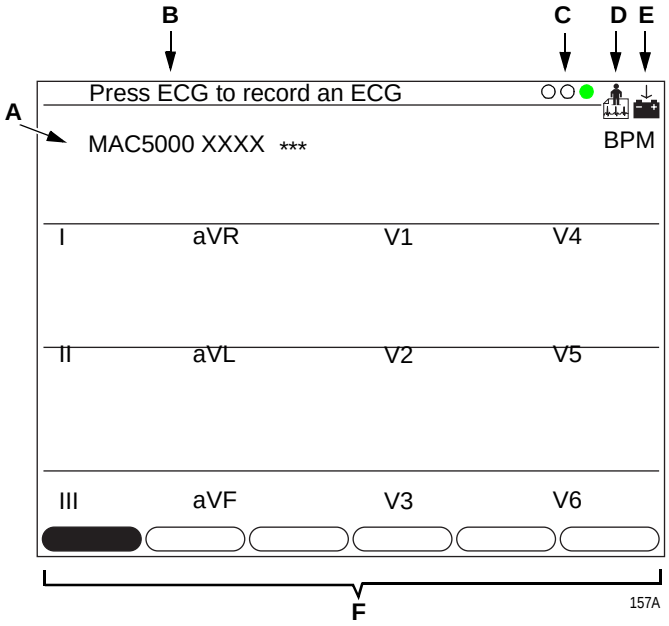
Verify Correct Operation

Press power to turn on the MAC 5000 System.

- If the system starts up without displaying error messages, the system is operational.
- If the system displays error messages, turn the system power off, then on again. If error messages persist, contact GE Medical Systems Information Technologies Service.

Software Description

Start Up Screen

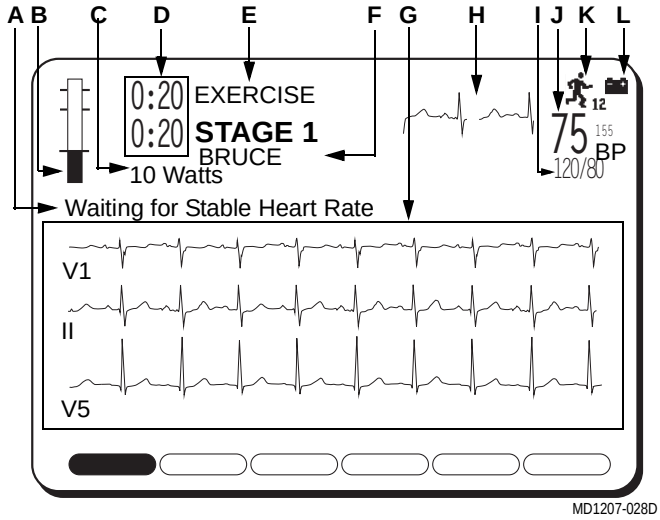


	Name	Description
A	software version	Displays the system's software version during the first few seconds of power up.
B	user prompts	Provides additional information.
C	Hookup Advisor	Displays quality of patient hookup. This can be turned on or off.
D	function icon	Indicates the *Main Menu* function the system is using. This is the *Resting ECG* function.
E	battery status icon	Indicates how much charge the battery has available.
F	menu	Provides access to additional settings or functions.

Main Menu

Use the *Main Menu* to select the different functions available on this system. The functions displayed in your *Main Menu* may vary due to the installation of purchased software options.

Start Up Screen (Exercise Option)



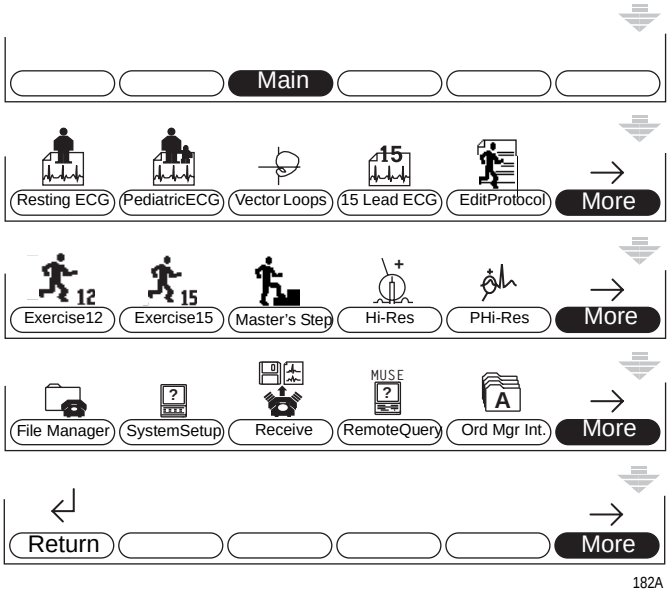
	Name	Description
A	system messages	Error or informational messages appear in this area.
B	current heart rate bar graph	The top horizontal line is the maximum predicted heart rate (220 - age). The line below that is the target heart rate (a percentage of 220 - age). At the start of *EXERCISE* phase, a third line representing the resting heart rate will appear.
C	workload level	Indicates the units of measurement and can be changed.
D	phase and stage clocks	The top clock displays the total time in a phase. The bottom clock displays the time in a stage. During the *TEST-END* phase, the top clock displays total time in the *EXERCISE* phase and the bottom clock displays total time in the *RECOVERY* phase.
E	current phase and stage name	Top is phase name, bottom is stage name.
F	protocol name	The name of the selected protocol is displayed.
G	Rhythm formats	Use *System Setup* (see Chapter 14, "System Setup") or *Ld Select* to change the leads displayed and printed.
H	medians	*Current*, *pretest*.
I	systolic/diastolic blood pressures	The *BP* numbers become dim if the *BP* has not changed in over one minute.
J	current heart rate	Determined by the three leads displayed on your screen during the *PRE-TEST* phase.

	Name	Description
K	function icon	Indicates the *Main Menu* function the system is using. This is the *Exercise* function.
L	battery status icon	Indicates how much charge the battery has available.

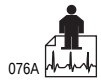
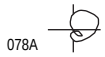
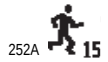
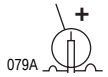
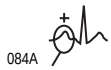
Main Menu

Use the *Main Menu* to select the different functions available on this system. The functions displayed in your *Main Menu* may vary due to the installation of purchased software options.

1. Select *More* from the start up screen.
2. Select *Main Menu* to begin displaying the *Main Menu* functions.



Main Menu Functions

Function	Description
 *Resting ECG*	Records a 12-lead ECG.
Pediatric ECG	Records a 15-lead pediatric ECG. The standard 12 leads and the V3R, V4R, and V7 leads are used.
 *Vector Loops*	Records a 15 lead vector cardiogram. The standard 12 leads and the X,Y,Z leads are used.
15 lead ECG	Records an adult 15 lead ECG. The standard 12 leads and three user-defined leads are used.
EditProtocol	*EditProtocol* creates new or edits existing exercise test protocols. Also, a protocol can be saved, printed, or erased.
Exercise12	*Exercise12* conducts the 12-lead exercise test and allows you to print reports. This is a purchased option.
 *Exercise15*	*Exercise15* conducts the 15-lead (12 standard, 3 user defined leads) exercise test and allows you to print reports. This is a purchased option.
Master's Step	Runs the *Master's Step* exercise protocol. (Japan only.)
 *Hi-Res*	Records a signal-averaged high-resolution ECG. This is a purchased option.
 *PHi-Res*	Records a p-wave signal-averaged high-resolution ECG. This is a purchased option.

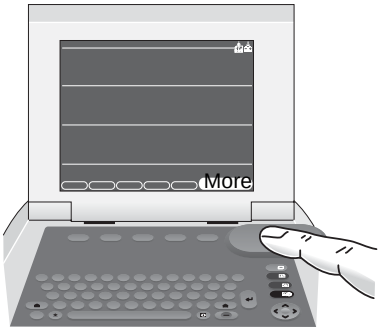
Function	Description
080A *File Manager*	Prints, edits, displays, transmits, and deletes ECG data stored to a disk.
082A *System Setup*	Defines the operating parameters of the system.
081A *Receive*	Receives ECG data from other devices.
083A *Remote Query*	Requests, displays, and prints confirmed ECGs retrieved from a MUSE CV system. This is a purchased option.
086A *Ord Mgr Int.*	Acquires, prints, and stores ECG orders received from a MUSE CV system with a Hospital Information System (HIS) interface.
271A *Return*	Return to the previous screen.

Selecting Menu Functions

The following shows two methods for selecting a menu function.

Pressing a Function Key

To select *More*, press the function key directly below *More*.



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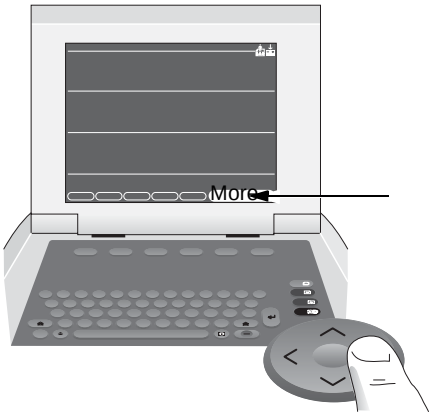
Using the Arrow Pad

To select *More*:

1. Press the right arrow on the arrow pad until *More* is highlighted.



176A

2. Press the middle of the pad to select *More*.

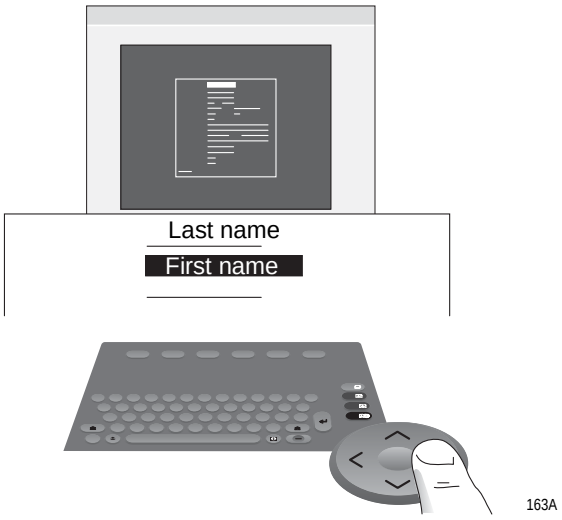
To select a menu function:

1. Use the arrow keys to highlight the desired item.
2. Press the middle of the pad to select the highligted item.
3. Select the appropriate function.

Entering Data

Type Data into a Highlighted Field

1. Press the right or down arrow to highlight the *First name* field.



2. Type the patient's first name.
3. Press the middle of the pad or the return key to enter the information. The cursor goes to the next data field.

Selecting Items from a List

1. Press the right arrow to highlight *Gender*.
2. Press the middle of the pad to lock the list in place.

4. Press the down arrow to highlight *Male* or *Female*.
5. Press the middle of the arrow pad to confirm the selection. The cursor goes to the next data field.

3 Preparing the Patient

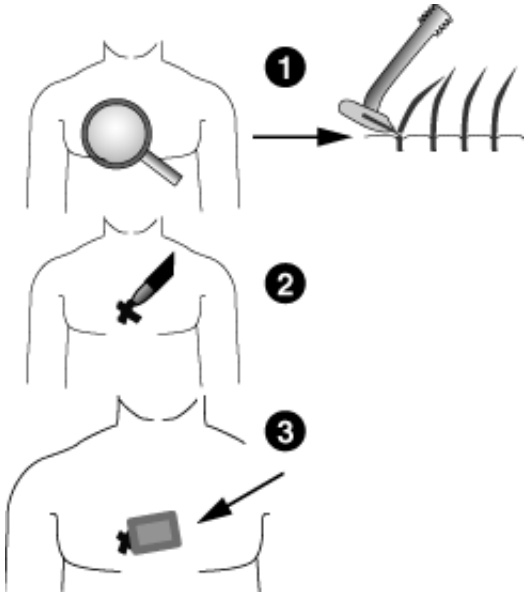
For your notes

Prepare the Patient's Skin

NOTE

To use the KISS Electrode Application System, see the KISS operator's manual for instructions. (The KISS system is not available for sale in the United States.)

Careful skin preparation is the key to an interference-free ECG. The signal quality is shown on the Hookup Advisor indicator.



39A

1. Shave any hair from each electrode site and degrease each electrode site with alcohol. If conducting a stress test, proceed to steps 2 and 3. If you are not conducting a stress test, skip ahead to step 4.
2. Mark each electrode site with a felt tip pen.
3. Remove the epidermal skin layer at each electrode site (i.e. remove the mark left from the felt tip pen). Use an abrasive pad or skin prep cream.
4. Apply electrode to prepared area.
5. Look at the lead-check screen for indication of lead problems.

NOTE

Use only electrodes and contact agents recommended by GE

Medical Systems *Information Technologies*. The signal quality on the lead-check screen will not be indicated until the RA/R electrode has been applied. When RA/R becomes disconnected, the system will report that all electrodes are off the patient.

WARNING

Shock Hazard— Ensure that conductive parts of the electrodes or lead wires do not come in contact with other conductive parts.

This would cancel the protection provided by the isolated signal input.

WARNING

Conductive Parts— Keep the conductive parts of lead electrodes and associated parts away from other conductive parts, including earth.

Apply the Electrodes

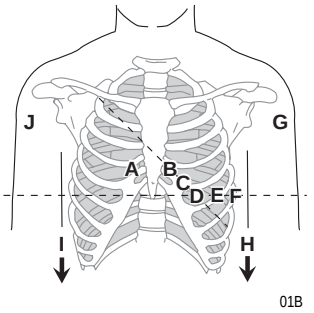
CAUTION

Proper Leadwire Conenection — Improper connection will cause inaccuracies in the ECG.

Trace each individual leadwire from its acquisition module label to the colored connector and then to the proper electrode to ensure that it is matched to the correct label location.

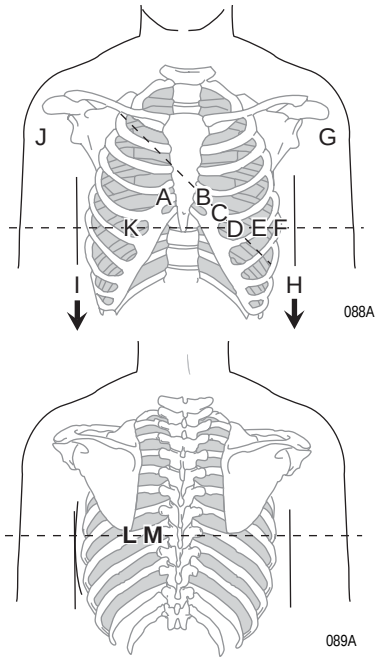
Resting Electrodes

Standard 12 Lead Placement



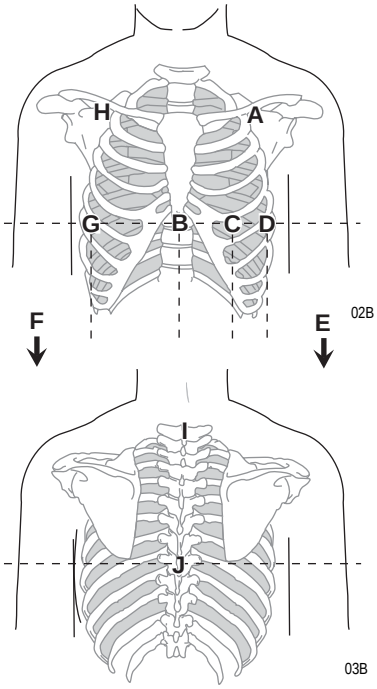
	AHA Label	IEC Label	Electrode Placement
A	V1 red	C1 red	Fourth intercostal space at the right sternal border.
B	V2 yellow	C2 yellow	Fourth intercostal space at the left sternal border.
C	V3 green	C3 green	Midway between location B and D.
D	V4 blue	C4 brown	Mid-clavicular line in the fifth intercostal space.
E	V5 orange	C5 black	Anterior axillary line on the same horizontal level as D.
F	V6 purple	C6 purple	Mid-axillary line on the same horizontal level as D and E.
G	LA black	L yellow	Left deltoid.
H	LL red	F green	Above left ankle. (Alternate placement, upper leg as close to torso as possible.)
I	RL green	N black	Above right ankle. (Alternate placement, upper leg as close to torso as possible.)
J	RA white	R red	Right deltoid.

Standard 15 Lead Placement



	AHA Label	IEC Label	Electrode Placement
A	V1 red	C1 red	Fourth intercostal space at the right sternal border.
B	V2 yellow	C2 yellow	Fourth intercostal space at the left sternal border.
C	V3 green	C3 green	Midway between location B and D.
D	V4 blue	C4 brown	Mid-clavicular line in the fifth intercostal space.
E	V5 orange	C5 black	Anterior axillary line on the same horizontal level as D.
F	V6 purple	C6 purple	Mid-axillary line on the same horizontal level as D and E.
G	LA black	L yellow	Left deltoid.
H	LL red	F green	Above left ankle. (Alternate placement, upper leg as close to torso as possible.)
I	RL green	N black	Above right ankle. (Alternate placement, upper leg as close to torso as possible.)
J	RA white	R red	Right deltoid.
K	V4R gray	C4R gray	Right anterior chest opposite of D.
L	V8 gray	C8 gray	Under left midscapular line.
M	V9 gray	C9 gray	Left paraspinal border.

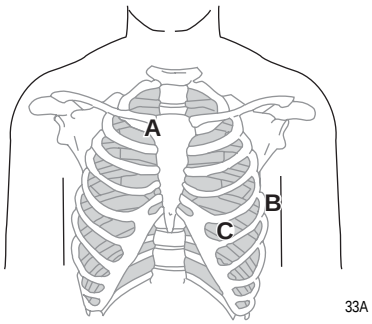
Frank X,Y,Z Placement



	AHA Label	IEC Label	Electrode Placement
A	LA black	L yellow	Just below the clavicle of the left arm.
B	E orange	E light blue	Mid-sternum on the same horizontal level as C and D.
C	V4 blue	C4 brown	Mid-clavicular line in the fifth intercostal space.
D	V6 purple	C6 purple	Mid-axillary line on the same horizontal level as C.
E	LL red	F green	Left leg, lower abdominal quadrant.
F	RL green	N black	Right leg, lower abdominal quadrant.
G	I orange	I light blue	Right mid-axillary line on the same horizontal level as C and D.
H	RA white	R red	Just below the clavicle of the right arm.
I	H orange	H light blue	Back of neck, avoid the carotid artery and jugular vein.
J	M orange	M light blue	Center of spine on the same horizontal level as C and D.

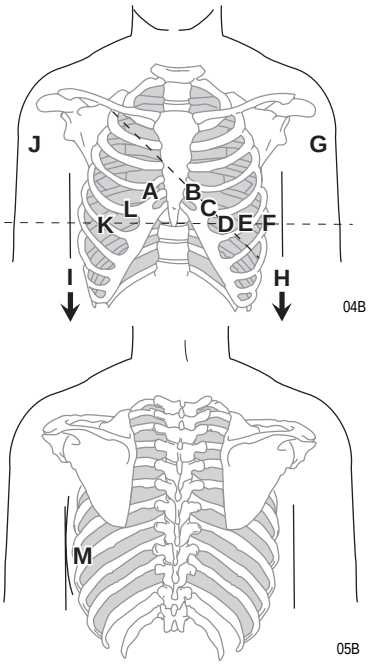
NEHB Placement

To acquire a NEHB ECG, use the Standard 12 Lead electrode placement and items A and B shown below.



	AHA Label	IEC Label	Electrode Placement
A	A1 orange	Nst white	Attachment point of the 2nd rib to the right sternal edge.
B	A2 orange	Nax white	5th intercostal space on the left posterior axillary line. (Same position as V8 or C8.)
C	V4 blue	Nap white	Mid-clavicular line in the fifth intercostal space. (Same position as C4.)

Pediatric Placement

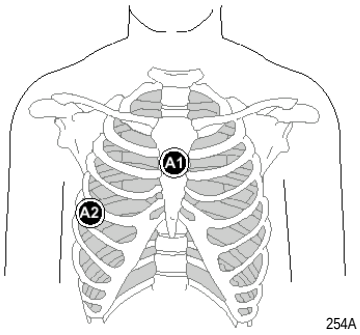


	AHA Label	IEC Label	Electrode Placement
A	V1 red	C1 red	Fourth intercostal space at the right sternal border.
B	V2 yellow	C2 yellow	Fourth intercostal space at the left sternal border.
C	V3 green	C3 green	Midway between location B and D.
D	V4 blue	C4 brown	Mid-clavicular line in the fifth intercostal space.
E	V5 orange	C5 black	Anterior axillary line on the same horizontal level as D.
F	V6 purple	C6 purple	Mid-axillary line on the same horizontal level as D and E.
G	LA black	L yellow	Left deltoid.
H	LL red	F green	Above left ankle. (Alternate placement, upper leg as close to torso as possible.)
I	RL green	N black	Above right ankle. (Alternate placement, upper leg as close to torso as possible.)
J	RA white	R red	Right deltoid.
K	V4R gray	C4R gray	Mid-clavicular line in the fifth right intercostal space.
L	V3R gray	C3R gray	Halfway between A and K.
M	V7 gray	C7 gray	Same horizontal level of D in the left posterior axillary line.

Exercise Electrodes (with Exercise–Option)

In addition to the standard electrodes, apply one electrode on the sternum (A1) and one in location V5R/C5R (A2). It is recommended that arm electrodes be placed on the patient's torso, just under the clavicles.

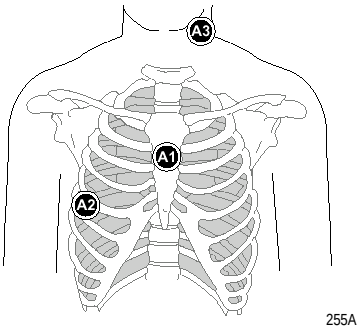
CM5, CC5, ML Lead Placement



Electrode	Electrode Placement
A1	Mid-sternum at the second intercostal space.
A2	In the fifth intercostal space in the right anterior axillary line (V5R/C5R).

In addition to the standard electrodes, apply one electrode on the sternum (A1), one in location V5R/C5R (A2), and one on the neck (A3).

CM5, CC5, CH Lead Placement



Electrode	Electrode Placement
A1	Mid-sternum at the second intercostal space.
A2	In the fifth intercostal space in the right anterior axillary line (V5R/C5R).
A3	On either side of the neck or anywhere above the shoulders.

4 Entering Patient Information

For your notes

Enter Patient Information

NOTE

Before entering patient data, be sure that the unit is powered on and that a diskette is in the disk drive.

Enter the Information

Select **F1** (*Patient Data*) for each new patient.

CAUTION

Accurate Patient Data— Patient data may be retained from a previous patient. Be sure to check the patient info screen for each new patient. Data assigned to the wrong patient causes erroneous patient data that can affect diagnosis and treatment of the patient(s).

Make sure that you enter patient data for the correct patient.

NOTE

Our equipment contains several fields which can be filled in before performing an ECG. Some of these fields must be filled in before performing an exam, some are optional and therefore left to the user to assess whether they are needed to perform the exam. A field *RACE* is one of these optional fields. It has been acknowledged by the medical profession as useful to analyze some pathologies. You should be aware that, in some jurisdictions, the processing of data revealing an individual's racial origin is subject to legal requirements, such as obtaining the patient's prior consent. If you elect to collect this type of data, it is your responsibility to ensure that you comply with all applicable legal requirements.

Using a Patient Card Reader (Option)

Connect and Configure the Card Reader

1. Connect the card reader to the **A** port on the back panel of the MAC 5000.
2. Configure the card reader. See "Card Reader Option Setup" on page 14-31.

Slide Card

Slide the patient data card through the optional card reader when you are prompted.

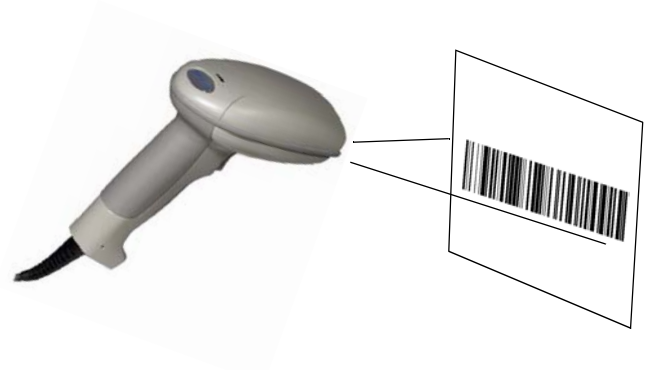
Using a Bar Code Reader (Option)

Connect and Configure the Bar Code Reader

1. Connect the bar code reader to the **A** port on the back panel of the MAC 5000.
2. Configure the bar code reader. See Chapter "Bar Code Reader Option Setup" on page 14-33.

Scan the Bar Code

Scan the patient's bar code with the bar code reader when you are prompted.



NOTE

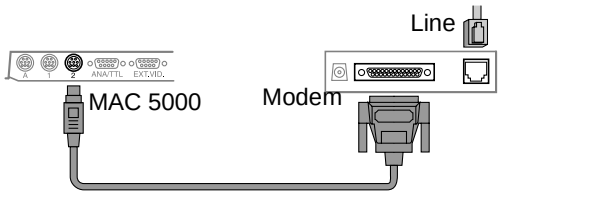
Do not use the bar code reader for scanning the bar code that appears on the ECG printout. The bar code on ECG printout is of a different format and not readable by the bar code reader.

Receive Orders from a MUSE CV System (Option)

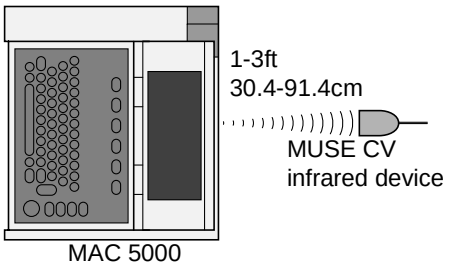
Preparation

The MUSE CV System can communicate orders to a MAC 5000 System in the following ways:

- via modem,



- via infrared, and



- via wireless communication (MobileLink or MobileLink UHS wireless system). Instructions for mounting, configuration, and connecting the client bridge to the MAC 5000 can be found in the MobileLink or MobileLink UHS Installation and Troubleshooting Guide.

NOTE

Performance of the MobileLink wireless system may vary due to changes in RF (radio frequency) properties of your site or environmental conditions. If you are experiencing intermittent connectivity in certain areas of your facility, re-initiate the process of receiving from the MUSE system. Consult your hospital IT department or your local GE Medical Systems Information

Technologies networking professional regarding modification of your wireless LAN to improve system performance.

Load the Orders

NOTE

Before receiving orders from the MUSE CV system, be sure that the unit is powered on and that a diskette is in the disk drive.

1. Select *Ord Mgr Int*. The Order Manager interface opens.
2. Select *Load Orders*.
3. Choose to delete the old orders or load the new orders.
4. Enter the location(s) from which the device should retrieve the orders.

Select the Orders to Receive

1. Select one or more orders.
2. Select *Return*. The system stores the orders.

Select an Order to Complete

1. Select *Select*.
2. Select an order.
3. Select *Continue* to proceed with selecting this order. The system will then go to the ECG test.

   or

   Select *Cancel* to abort the selection of this order. You can then select a different order to complete.

Complete the Order

1. Select *Patient Data*. The patient data window for this patient displays.
2. Enter patient data or modify the patient data that is diaplayed.
3. Select *Return* to proceed with completing this order. The system will then go to the ECG test.

Enter Orders Manually (Option)

NOTE

Before manually creating orders, be sure that the unit is powered on and that a diskette is in the disk drive.

Manually Create an Order

1. Select *Ord Mgr Int*. The Order Manager interface opens.
2. Select *Create Order*. A window opens to enter the manual order.
3. Enter the patient data.
4. Select *Return* to close the window. The system saves the order.

Selecting and Completing Manually Created Orders

Manually created orders are selected and completed the same way downloaded orders are selected and completed.

- Refer to "Select an Order to Complete" on page 4-7 for information on selecting an order.
- Refer to "Complete the Order" on page 4-7 for information on completing an order.

5 Recording an ECG

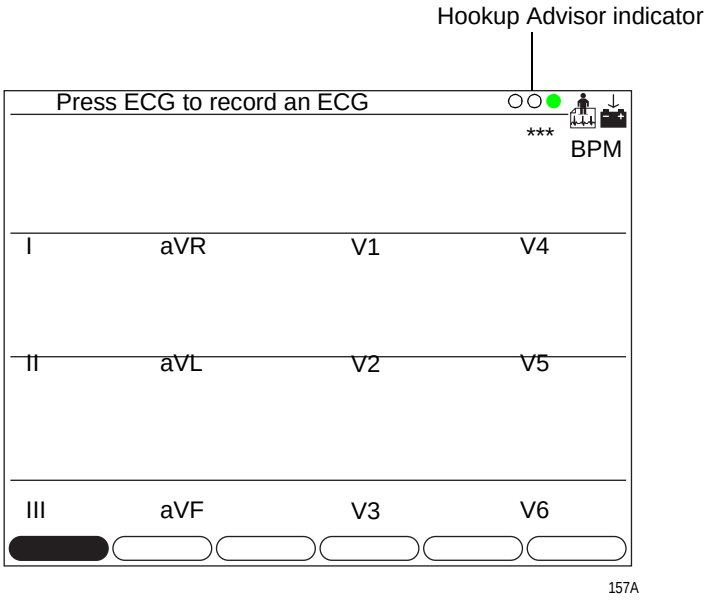
For your notes

Hookup Advisor

The MAC 5000 System offers the Hookup Advisor feature, which is a tool for monitoring the quality of resting ECG signals, and is available in the resting, pediatric, 15 lead, vector loops, and Master's Step applications. It can reduce or eliminate the occurrence of poor technical quality ECGs, save time, and prevent the need for retakes.

When Hookup Advisor is enabled, a three-circle indicator appears on the display.

- Red indicates a lead-fail condition or extreme baseline shifts. The red indicator is always the leftmost circle of the of the indicator.
- Yellow indicates muscle artifact, power line interference, baseline wander, or electrode noise. The yellow indicator is always the middle circle of the of the indicator.
- Green indicates generally acceptable signal quality. The green indicator is always the rightmost circle of the of the indicator.



When the lead quality is Red or Yellow, a message describing the lead problem or status is displayed on the screen.

Hookup Advisor is enabled and configured in the ECG Acquisition menu (*System Setup > ECG > ECG Acquisition*). Refer to "ECG Acquisition" on page 14-15 for more information. In addition to enabling/disabling the Hookup Advisor feature, you can set the level at which the MAC 5000 System acknowledges poor signal quality. The acknowledgement level can be set to *Yellow* (default), *Red*, or *Never*.

Hookup Advisor continuously reviews the ECG data for acceptable lead quality.

- If *Pre-acquisition* is enabled in the system setup, the lead quality (circle) indicator will reflect the entire previous 10 seconds of ECG data. Any displayed messages will be updated on a real-time basis to reflect adjustments/improvements to the lead quality. Once any lead quality problems have been remedied, the message *Please wait...* will be displayed until the entire 10 second period is free from lead quality problems.
- When *Pre-acquisition* is not enabled, the Hookup Advisor level and messages will respond to a fixed poor lead quality problem within 2 – 3 seconds.

When an ECG is acquired, Hookup Advisor will run a complete and more comprehensive assessment of the full 10 seconds of ECG data and possibly prompt the user regarding any poor lead quality conditions.

- If *Preview before analysis* is turned off in the system setup, a lead quality message and prompt may be displayed, depending on the current lead quality level and the *Prompt* level in the system setup. If a message and prompt is displayed, the lead quality indicator will reflect the overall 10-second lead quality.
- If *Preview before analysis* is enabled, the system setup *Prompt* level is disregarded and the system immediately displays the Preview screen. Any lead quality messages will be displayed in this screen along with the overall 10-second lead quality indicator.

In either case, users may then either:

- Select *Continue* to continue (print the ECG), or
- Select *Cancel* to cancel.

Record a Resting, Pediatric, Vector Loops, or 15 Lead ECG

NOTE
Before recording an ECG, be sure that the unit is powered on and that a diskette is in the disk drive.

NOTE
See "Enable or Disable the ACI-TIPI Option" on page 14-5 to enable or disable ACI-TIPI.

Record the ECG

Press the **ECG** button to initiate the recording of the ECG.

Print Another Report

Press the **copy** button to initiate another printout of the ECG report.

Store the ECG

If the *Saving file to Disk* message appears, the ECG is being saved to the diskette.

If the *Saving file to Disk* message did not appear, select *Store* to save the ECG to diskette.

Transmit the ECG

If the *Establishing network connection* message appeared, the ECG is preparing to transmit.

If the *Establishing network connection* message did not appear, you will need to manually initiate the transmission. Refer to Chapter 9, "Transmitting an ECG" for more information.

Record a Signal Averaged ECG (Options)

NOTE

Before recording a signal averaged ECG, be sure that the unit is powered on and that a diskette is in the disk drive.

1. Select *Hi-Res* or *PHi-Res* to enable the system to record a signal averaged ECG.

   NOTE

   To record a PHi-Res ECG, GE Medical Systems *Information Technologies* recommends a target noise level of 0.3MV or less.

2. Select *Template* to initiate the signal averaged ECG recording.
3. Change the seed beat:
   a. Select *Display*.
   b. Select *SelectQRS*.
   c. Select a new seed beat.
4. Select *Average* to average the ECG data.
5. Select *Store* to store the ECG data.
6. Select *Transmit* to transmit the ECG data. Refer to Chapter 9, "Transmitting an ECG" for more information.

Record a Master's Step Test (Option)

NOTE

Before recording a Master's Step test, be sure that the unit is powered on and that a diskette is in the disk drive.

1. Select *Master's Step*.
2. Enter the patient's demographics either manually with the keyboard or by using the card reader/bar code reader.
3. In the *Setup* menu, confirm that the following parameters are correct:
   - *Number of Steps,*
   - *Test Type,*
   - *Post J (ms),*
   - *Step Counter Display,*
   - *Sound Option*
   - *Continuous Recording,* and
   - *Post Exercise ECG Time.*

   Press the return key.
4. Press the **ECG** button to record a pre-exercise ECG.

Run the Test

1. Remove the leadwires from the patient (to prevent the patient from tripping on the leadwires). Keep the electrodes on the patient.
2. Press *Continue* to begin the exercise test.
3. When the patient finishes the exercise, immediately reattach the leadwires to the electrodes. Check the waveform quality on the screen to confirm that all leadwires are correctly reattached.
4. The MAC 5000 automatically records additional ECGs requested.
5. Once you record all ECGs, a final report prints.
6. Select *Store* to store the ECG data.

7. Select *Transmit* to transmit the ECG data. Refer to Chapter 9, "Transmitting an ECG" for more information.

Using ACI-TIPI (Option)

NOTE

Before using the ACI-TIPI option, be sure that the unit is powered on and that a diskette is in the disk drive.

Refer to Chapter 14, "System Setup" for information on enabling the ACI-TIPI option.

You must have a report "with interpretation" selected in *System setup* in order to obtain an ACI-TIPI report.

1. Enter the patient's demographics either manually with the keyboard or by using the card reader/bar code reader.
2. Press the ECG button.
3. Enter the ACI-TIPI data.
   - *Age* (*18-40, 41-50, >50*),
   - *Gender* (*Male/Female*), and
   - *Chest or Left Arm Pain* (*Chief Complaint, Secondary Complaint, Not Present*).
     - *Chief Complaint*: Select this option if the complaint of chest or left arm pain is the primary reason the patient came to the hospital.
     - *Secondary Complaint*: Select this option if the complaint of chest or left arm pain is secondary– the patient came to the hospital because of other symptoms.
     - *Not Present*: Select this option if the patient has no chest or left arm pain or equivalent discomfort.

     Select *Return*.
4. Print, store, and transmit the ECG based on instructions given on page 5-5.

6 Exercise Stress Test (Option)

For your notes

Start an Exercise Stress Test

NOTE

Before recording an ECG, be sure that the unit is powered on and that a diskette is in the disk drive.

You may store data during an exercise test to diskette (see "Final Report" on page 14-26). The data is stored to the protocol diskette. Make sure there is sufficient free space on the diskette before starting the test.

Preparation

1. Select *Exercise12* or *Exercise15* to enter stress test mode.
2. Select *Patient Data*. The *Patient Data Entry* screen opens.
3. Enter patient data.
4. Prepare the patient for the test, and attach leadwires. Refer to Chapter 3, "Preparing the Patient" for more information.
5. Select *Protocol* to open the list of available stress test protocols.
6. Select the desired protocol.

Legal Notice

Our equipment contains several fields which can be filled in before performing an ECG. Some of these fields must be filled in before performing an exam, some are optional and therefore left to the user to assess whether they are needed to perform the exam. A field *RACE* is one of these optional fields. It has been acknowledged by the medical profession as useful to analyze some pathologies. You should be aware that, in some jurisdictions, the processing of data revealing an individual's racial origin is subject to legal requirements, such as obtaining the patient's prior consent. If you elect to collect this type of data, it is your responsibility to ensure that you comply with all applicable legal requirements.

Exercise Test Keys

The Exercise test keys perform the functions listed in the table.

Key	Function
Pretest	Press to advance to the pretest phase.
Exercise	Press to advance to the exercise phase.
Recovery	Press to advance to the recovery phase.
Test end	Press and hold to end the test and start the test end phase.
Speed W + **Speed W –**	Press to increase or decrease the belt speed or ergometer load.
Grade	Press to change the elevation of the treadmill belt.
Start tmill	Press to start the treadmill during the test.
STOP tmill	Press stop the treadmill during the test.
Recall	Press to print a 10-second delayed recall report.
12 ld	Press to print a 12 lead report.
Medians	Press to print a medians report.
Comment	Press to enter comments that will be stored with the record and printed on some of the final reports.
Enter BP	Press to enter BP readings or to trigger a reading from an external device.

Test Phases

Pretest Phase

Overview

The pretest phase consists of stages configured in each protocol. Commonly used stages are:

- Supine
- Standing
- Hyperventilating

You can configure the *Protocol Editor* to take blood-pressure measurements manually or automatically. (See Chapter 7, "Editing Protocols").

The system will beep and display a message prompt in the header of the display when it is time to take a manual blood pressure measurement.

A set of medians is saved at the end of the *Pretest* phase as baseline medians.

Operating Steps

1. On the stress keypad, press **12 ld** to acquire and print a baseline ECG.
2. Press **Pretest** to advance to the next *PRE-TEST* stage.
3. If you are using a treadmill to conduct the exercise test, tell the patient to place his/her feet on the treadmill frame, not on the belt.

WARNING

Fall Hazard— Severe injury can result from a fall.

Patients should wait until the treadmill belt is moving before stepping onto the belt. Step onto the belt with one foot at a time. Avoid rapid changes in belt speed.

WARNING

Pinch Point Hazard— Hair, jewelry, and loose clothing can catch in moving parts.

Keep these and other items away from moving parts. Otherwise, serious injury could result.

Press **Start tmill** (on the treadmill controller keyboard) to start the treadmill belt moving. During the exercise test, you can:

- Press **STOP tmill** once (on the treadmill controller keyboard) to stop the treadmill GRADUALLY.
- Press and hold **STOP tmill** (on the treadmill controller keyboard) to stop the treadmill belt QUICKLY.
- Press the emergency stop button (usually mounted on the treadmill) to stop the treadmill QUICKLY.
- Press **Speed W +** or **Speed W –** and **Grade** keys (on the treadmill controller keyboard) to manually control the test. However, once you press these keys, you control the speed and grade during the remainder of the *EXERCISE* and *RECOVERY* phases, not the protocol.

Pretest Phase Buttons

Menu	Function
Patient Data	Enter a patient's name, ID number, etc. Enter the patient's age to allow your system to calculate the maximum and target heart rates.
New Protocol	Select a different exercise test protocol. This function is only available if the test will be printed only (not stored to a diskette).
Measurements	Will allow the system to reestablish the median complex, set the J point, then select the three leads used to calculate heart rate.
Leads	Select the leads used for 3 or 6 *Rhythm leads, All Leads, Lead Check,* or *Lead Placement*.

Menu	Function
Median	Select a lead to act as the median lead. This can be a fixed lead or scanned for lead with most ST depression.
Writer	Change the writer's arrhythmia documentation (doc.), cubic spline (baseline control), paper speed, gain, filter, and writer on/off settings.

Exercise Phase

Overview

The selected protocol controls the treadmill or ergometer. When you enter the exercise phase:

- The belt speed and grade or the ergometer workload change according to the selected protocol,
- The exercise clock (top) starts, and
- The system starts to save the test data.

Operating Steps

WARNING

Fall Hazard— Severe injury can result from a fall.

Patients should wait until the treadmill belt is moving before stepping onto the belt. Step onto the belt with one foot at a time. Avoid rapid changes in belt speed.

1. Press the **Exercise** button to begin the exercise phase.

   During the test you can manually perform operations from the function keyboard.

2. Press the **Start tmill** button if treadmill or ergometer has not been started yet.

   If you are using an ergometer, the ergometer workload is automatically controlled.

   The exercise test advances automatically through the exercise stages unless the operator manually overrides the test.

NOTE

When the stages in the treadmill protocol have durations other than infinite, the exercise test advances from stage to stage automatically. However, you can press **Exercise** (on the treadmill controller keyboard) at any time to manually advance to the next *EXERCISE* stage.

3. You can manually change a treadmill's speed and grade however this puts you in the manual mode for the remainder of the test.

   - Press **Speed W +** (to increase speed) within 5 seconds of your last workload change.
   - Press **Speed W –** (to decrease speed) within 5 seconds of your last workload change.
   - Press **Grade +** (to increase grade) within 5 seconds of your last workload change.
   - Press **Grade –** (to decrease grade) within 5 seconds of your last workload change.

Exercise Phase Buttons

Menu	Function
Event	Press to display a list of predefined events.
Stage Hold	In exercise phase, press to hold current stage.
Measurements	Will allow the system to reestablish the median complex, set the J point, then select the three leads used to calculate heart rate.
Leads	Select the leads used for 3 or 6 *Rhythm leads, All Leads, Lead Check,* or *Lead Placement*.
Median	Select a lead to act as the median lead. This can be a fixed lead or scanned for lead with most ST depression.
Writer	Change the writer's arrhythmia documentation (doc.), cubic spline (baseline control), paper speed, gain, filter, and writer on/off settings.

Recovery Phase

Overview

In recovery, the treadmill speed and grade or the ergometer load changes based on the protocol configuration.

Operating Steps

Press the **Recovery** button to advance to the recovery phase.

- The clock begins timing the recovery phase.

  A maximum 12-lead measurement is taken (if that is part of the selected protocol).

Recovery Phase Buttons

Menu	Function
Event	Press to display a list of predefined events.
Edit	Press during *Recovery* or *Test end* will allow user to enter or edit patient data, reason for test termination, or comments.
Measurements	Will allow the system to reestablish the median complex, set the J point, then select the three leads used to calculate heart rate.
Leads	Select the leads used for *Rhythm Lead 1, 2,* and *3, All Leads, Lead Check,* or *Lead Placement*.
Median	Select a lead to act as the median lead. This can be a fixed lead scanned for lead with most ST depression.
Writer	Change the writer's arrhythmia documentation (doc.), cubic spline (baseline control), paper speed, gain, filter, and writer on/off settings.

Test End Phase

Overview

After you press and hold **Test end** button, the following happens:

- The system no longer acquires and stores ECG measurement data,

- The treadmill and clocks stop, and
- Workload/speed/grade no longer display.

NOTE

The button for **Test end** MUST be held for more than one second to activate. This is done to prevent the test from being stopped by an accidental key press.

Operating Steps

1. Press and hold the **Test end** button to end the test and start the test end phase.
2. Select *Reason for termination* or *Comments* to enter information about this exercise test.
3. Select *Continue* to return to the *TEST-END* menu.

   A final report prints automatically if you selected this option in the *Edit Protocol* function (Select *Main Menu* → *Edit Protocol* → *TEST-END* phase screen → *Report column* → *Style column* → *Final*.)

   To change the type of reports that are printed automatically, see "Final Report" in chapter 14.
4. To edit *Patient Data, Reason for termination,* or *Comments,* select *Edit*. You can edit this information until you select *New Patient* or *Main Menu*.

   Select *Reports* to print a report containing the revised information.

   NOTE

   You can store the final exercise report to a diskette.

   You must define the type of final report you want stored to your system. (Select *System Setup, Exercise Report,* then *Final Report*.

Test End Phase Buttons

Menu	Function
Edit	Press during *Recovery* or *Test end* to edit patient data, enter reasons for termination of test, or comments regarding test.
Reports	Press during *Test end* to select a final report to print.

Menu	Function
Leads	Select the leads used for *Rhythm Lead 1, 2,* and *3, All Leads, Lead Check,* or *Lead Placement*.
Median	Select a lead to act as the median lead. This can be a fixed lead scanned for lead with most ST depression.
Writer	Change the writer's arrhythmia documentation (doc.), cubic spline (baseline control), paper speed, gain, filter, and writer on/off settings.
More	Select to see *More* menu options.
Main Menu	Return to the system *Main Menu*.
New Patient	Remain in the exercise application and start a test for a new patient.

7 Editing Protocols

For your notes

Operating Steps

You can edit an existing ergometer or treadmill protocol, or you can create a new protocol. These protocols are used to run an exercise test.

NOTE

Before editing a protocol, be sure that the unit is powered on and that a diskette is in the disk drive.

Follow these steps to edit an existing protocol or create a new protocol:

1. Select *Edit Protocol*.

   NOTE

   If using a blank diskette or one without stored protocols, default protocols will be written to the diskette.

2. Select a protocol to edit, or select *‹‹ spare ››* if you want to create a new protocol.

   The following table describes the items you can change on the screen.

Variable Protocols	
Menu Item	**Description**
Protocol name	Displays the name of the protocol you are editing. You may type a different name to begin creating a new protocol.
Menu name	Type the name of this protocol as you would like it to appear on your screen menu.
Exercise Test Type	Select *Treadmill in MPH or Km/h, Analog Treadmill in MPH or Km/h, Ergometer in Watts or KPM*. This is the type of exercise test you want to perform. Select *Treadmill* if using with a T2000 treadmill.
Ramp Protocol	Select *Yes* if you want the ergometer workload (or treadmill speed and grade) to change every 6 seconds. Select *No* if you want the ergometer workload (or treadmill speed and grade) to change every stage.
Name of PRETEST phase	Type the name of your *PRETEST* phase as you would like it to appear on your reports.

Variable Protocols	
Menu Item	**Description**
Name of EXERCISE phase	Type the name of your *EXERCISE* phase as you would like it to appear on your reports.
Name of RECOVERY phase	Type the name of your *RECOVERY* phase as you would like it to appear on your reports.
Name of FINAL phase	Type the name of your *FINAL* (*TEST-END*) phase as you would like it to appear on your reports.
Peak report style	Choose one of the following reports to print a time of peak exercise (during transition to *RECOVERY* phase from *EXERCISE* phase): *No report, 12/15 Ld, Medians,* and *5 second Rhythm*.

3. Select *Return* when you are finished changing the *Protocol name, Menu name,* etc. The first phase screen (usually called *PRETEST*) appears. The table below explains each column of the *PRETEST* phase screen.

Pretest Phase Screen	
Column	**What Does This Column Allow You to Do?**
Stage	Create multiple stages for each phase, except *TEST-END* where only one stage is allowed.
Duration	Set the duration of each stage. You may choose from 00:00-99:59 (minutes and seconds), or infinite duration. The last stage always has an infinite duration. This means that your MAC 5000 remains in the last stage for an infinite duration, or until you stop the exercise test.
Ergometer or	Set the ergometer workload in Watts or KPM. Select from 0 to 1000 Watts (5 watt increments.) Select from 0 to 6000 KPM (25 KPM increments.)
Treadmill	Set the treadmill speed in MPH or Km/h: Select from 0.0 to 25.0 MPH (0.1 MPH increments) Select from 0.0 to 40.0 Km/h (0.1 Km/h increments) Set the treadmill grade: Select from 0.0 to 40.0 percent (0.1 percent increments)

Pretest Phase Screen	
Column	**What Does This Column Allow You to Do?**
Report	Print reports during a stage automatically. Style sets the type of report that prints. You may choose *No Report, 12 Ld, Medians,* or a *5 second Rhythm* report. *First* indicates when the first report prints. *Repeat* indicates the frequency the reports print after the first report prints.
BP	Set blood pressure prompting during a stage. *First* indicates when the first blood pressure prompt occurs. *Repeat* indicates the frequency of blood pressure prompts after the first prompt occurs.
Median	Set how often Median complexes are saved during a stage for the final report. *First* indicates when the first Median is saved. *Repeat* indicates how often Median complexes are saved after the first Median complex is saved.

4. To edit *Stage* information, use the arrow pad to select the desired stage, then press the *Edit* function key. A box will pop up that will allow the stage information to be edited.

Pretest Protocol Information	
You want to...	**How do you change this item?**
Edit stage information.	Use the arrow pad to select the stage you want to edit. A pop-up box appears showing the current information for this stage. Edit the information for this stage in the pop-up box. Press return.
Add another stage to the phase.	When you add a stage, it is placed below the highlighted stage. Use the arrow pad to highlight a stage. Press Add to add a stage.
Change the *Duration* of a stage.	Use arrow pad to select the *Duration* field. Use the keyboard to enter the new stage duration. Type in the duration time or press delete to set to infinite duration. Press enter.

Pretest Protocol Information	
You want to...	**How do you change this item?**
Change the *Ergometer* workload or *Treadmill* speed and grade during a stage.	Use the arrow pad to select the ergometer work load, treadmill speed, or treadmill grade field. Use the keyboard to enter the new value for this stage. Type in the value or press the deletekey to indicate no workload value. Press the return key. **WARNING** FallHazard— Severe injury can result from a fall. Patients should wait until the treadmill belt is moving before stepping onto the belt. Step onto the belt with one foot at a time. Avoid rapid changes in belt speed.
Change the *Report Style* printed automatically during a stage.	Use the arrow pad to select the *Report Style* field. Use the arrow pad to select the stage *Report Style* you want to change. A pop-up box appears showing the types of reports available. Use the arrow pad to select the report you want to print automatically for this stage. Press the return key.
Change the *Report, Median* and *BP First/ Repeat* values for a stage.	Use the arrow pad to select the appropriate field. Type in your own time value or press the delete key to indicate no Report, Median, or BP for this stage. Press the return key.

Advance to Exercise

Advance to the *EXERCISE* phase using one of the following methods:

- Press **Phase**.
- Next, press **Exercise**.

1. To edit the settings for the *MANUAL* mode of operation, choose the menu option, *STAGES/MANUAL*, via the function keys to switch from the *STAGES* mode of operation to the *MANUAL* mode.

   NOTE

   When you create or edit a ramp protocol, always define at least four interim stages between the first and last stage. This prevents abrupt changes in workload or speed and grade if the stage advances accidentally.

2. Change the *EXERCISE* phase information. See “Pretest Protocol Information” earlier in this chapter as a sample guide for editing this protocol information.

Advance to Recovery

Advance to the *RECOVERY* phase using one of the following methods:

- Press **Phase**.
- Next press **Recovery**.

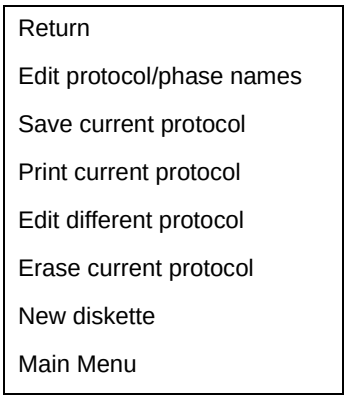
  Change the *RECOVERY* phase information. See “Pretest Protocol Information” earlier in this chapter as a sample guide for editing this protocol information.

Advance to Test End

Advance to the *TEST-END* phase using one of the following methods:

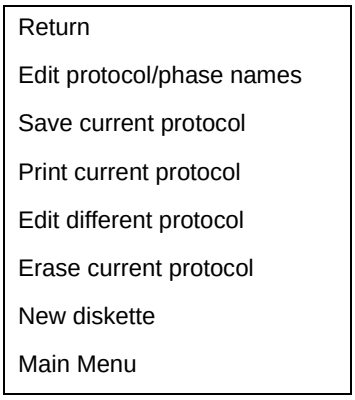
- Press **Phase**.
- Next press and hold **Test end**.

1. Change the *TEST-END* phase information. The only parameter that may be edited in *TEST-END* phase is the report type. You may choose: *No report* or *Final*.
2. Press **Menu** when you finish editing the phases of the protocol. An *Edit* menu similar to the following appears.



Save Current Protocol

1. Select *Save current protocol* to save your new or revised protocol.
2. Press **Menu** again. The *Edit* menu appears.



4. To add or change another protocol, select *Edit different protocol*.
5. Select *Main Menu* to display the *Main Menu*.
6. Select *Exercise* to run an exercise test.

8 Printing an ECG Report

For your notes

Print Stored ECG Reports

NOTE

Before printing a stored ECG report, be sure that the unit is powered on and that a diskette containing the ECG report to be printed is in the disk drive.

1. Select *File Manager*. A list of stored ECG reports displays.
2. Press *Select*.
3. Select one or more ECGs.
4. Select *Print*.

Print Another Report

To print another report of the same ECG in a different report format, follow these steps:

1. Run the test. The system will automatically print a report as configured in *System Setup*.
2. Select *More* to view the second screen of options.
3. Select *New Format*.
4. Highlight the additional reports to print.
5. Select *Return*.
6. Select *Print* or press the **copy** key to initiate the extra reports.

NOTE

Changes here affecting only the current ECG. Once another ECG is recorded, the reports specified in the system setup are printed. Refer to Chapter 14, "System Setup" for more information.

9 Transmitting an ECG

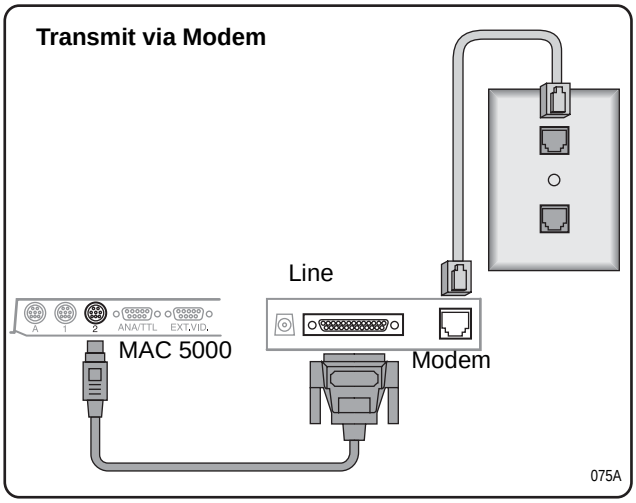
For your notes

Transmit Stored ECGs by Modem (Option)

NOTE

Before transmitting an EGG report, be sure that the unit is powered on and that a diskette containing the ECGs to be transmitted is in the disk drive.

Also, be sure that the MAC 5000 System is connected to the modem as show below.



1. Select *File Manager*. A list of ECGs displays.
2. Select *Location* to display a list of devices to which the ECG report can be transmitted displays.
3. Select the receiving device.
4. If this is the correct receiving device, select and transmit the ECGs as described in the next steps.

   If this is not the correct receiving device, follow these steps:

   - Select *Location*.
   - Select *Manual Dial*.
   - Enter the telephone number of the receiving device.
   - Press the return key.

- Select a modem type.
- Select *Return*.

5. Select the ECGs to be transmitted.
6. Select *Transmit* to transmit the ECGs.
7. If you want to transmit ECG reports from a different disk, select **esc**. Insert the appropriate disk in the disk drive. Select *New Disk*. Repeat steps 2 through 6 above.

   or

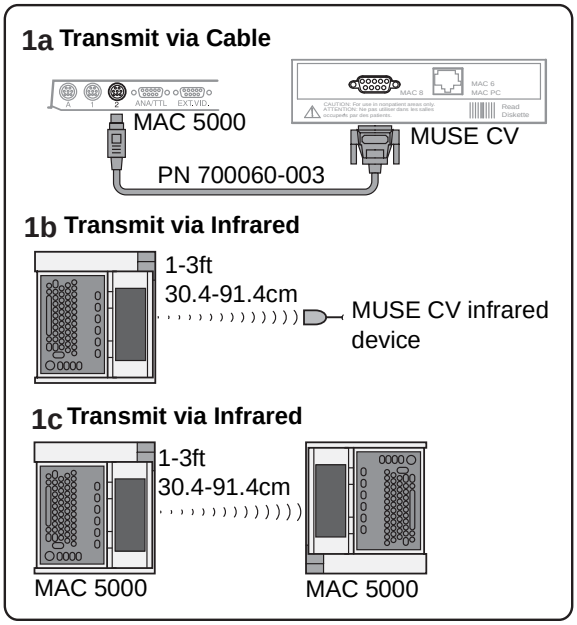
   Select *Main Menu* to continue.

Transmit Stored ECGs Locally

NOTE

Before transmitting an EGG report, be sure that the unit is powered on and that a diskette containing the ECGs to be transmitted is in the disk drive.

Preparation



1. Select *File Manager*. A list of ECGs displays.
2. Select *Location* to determine the method of transmission. Choices are *Serial Line* or *MUSE Network*.
3. Select *Select*. A list of available ECGs displays.
4. Select one or more ECGs.
5. Select *Transmit* to transmit the ECGs.
6. If you want to transmit ECG reports from a different disk, select **esc**. Insert the appropriate disk in the disk drive. Select *New Disk*. Repeat steps 2 through 5 above.

or

Select *Main Menu* to continue.

Transmit Stored ECGs by Wireless (Option)

NOTE

Before transmitting an EGG report, be sure that the unit is powered on and that a diskette containing the ECGs to be transmitted is in the disk drive.

Connect and configure the MobileLink wireless option as described in the MobileLink Installation and Troubleshooting Guide.

1. Select *Location* to determine the receiving device. The choice for wireless communication is *Serial Line — MUSE Network*.
2. Select *Select*. A list of available ECGs displays.
3. Select the ECGs to be transmitted.
4. Select one or more ECGs.
5. Select *Transmit* to transmit the ECGs.
6. If you want to transmit ECG reports from a different disk, select **esc**. Insert the appropriate disk in the disk drive. Select *New Disk*. Repeat steps 2 through 5 above.

   or

   Select *Main Menu* to continue.

NOTE

Performance of the MobileLink wireless system may vary due to changes in RF (radio frequency) properties of your site or environmental conditions. If you are experiencing intermittent connectivity in certain areas of your facility, it may be necessary to re-initiate the process of transmitting to the MUSE system. You may also wish to consult your hospital IT department or your local GE Medical Systems Information Technologies networking professional regarding modification of your wireless LAN to improve system performance.

Transmit Stored ECGs to the Serial Port in XML Format

NOTE

Before transmitting an EGG report, be sure that the unit is powered on and that a diskette containing the ECGs to be transmitted is in the disk drive.

1. Connect the MAC 5000 serial port to the serial port of a PC running a terminal emulation program.
2. Select the *Location*. From the *Main Menu*, select *File Manager* →*Location* → *XML Output*.
3. Select *Select*. A list of available ECGs displays.
4. Select the ECGs to be transmitted.
5. Select one or more ECGs.
6. Select *Transmit* to transmit the XML files.
7. If you want to transmit ECG reports from a different disk, select **esc**. Insert the appropriate disk in the disk drive. Select *New Disk*. Repeat steps 2 through 6 above.

   or

   Select *Main Menu* to continue.

10 Receiving an ECG

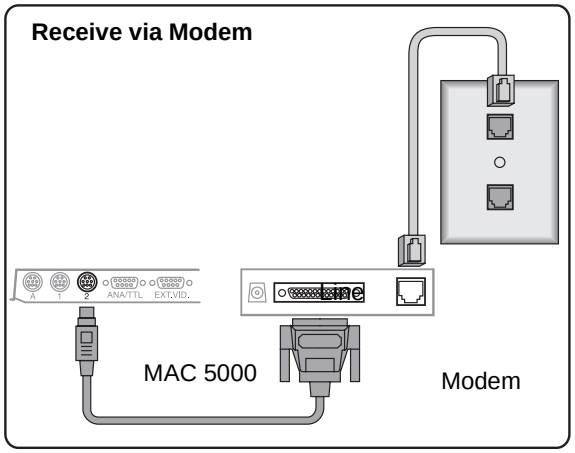
For your notes

Receive ECGs by Modem (Option)

NOTE

Before receiving an EGG report, be sure that the unit is powered on and that a diskette with sufficient available space is in the disk drive.

Also, be sure that the MAC 5000 System is connected to the modem as show below



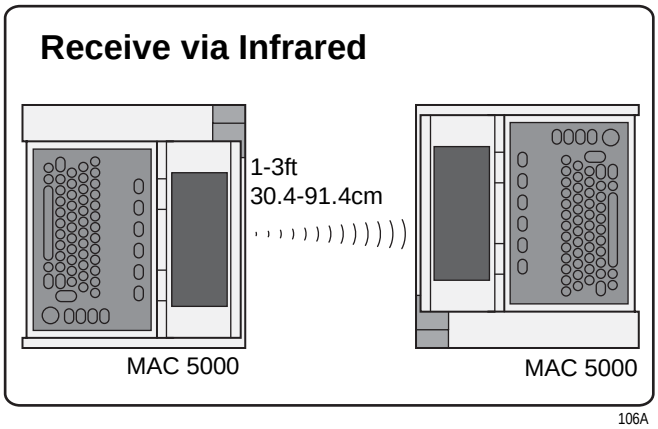
075A

1. Select *Receive* to prepare the MAC 5000 System for receiving ECG reports.
2. Select *Phone Line*. The system is ready to receive ECGs.
3. When all of the ECGs are received:
   a. Select *Cancel* to take the MAC 5000 System out of receiving mode.
   b. Select *Main Menu*.

Receive ECGs Locally

NOTE

Before receiving an EGG report, be sure that the unit is powered on and that a diskette with sufficient available space is in the disk drive.



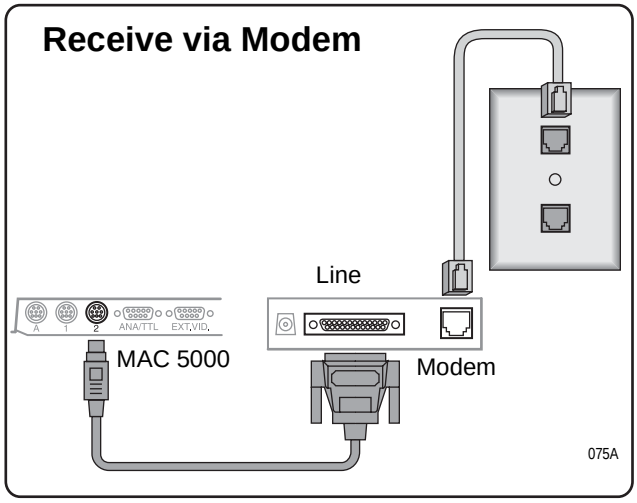
1. Select *Receive* to prepare the MAC 5000 System for receiving ECG reports.
2. Select *Local Lin*e. The system is ready to receive ECGs.
3. When all of the ECGs are received:
   a. Select *Cancel* to take the MAC 5000 System out of receiving mode.
   b. Select *Main Menu*.

Retrieve Confirmed ECGs from a MUSE CV System via Modem (Option)

NOTE

Before receiving an EGG report, be sure that the unit is powered on and that a diskette with sufficient available space is in the disk drive.

Also, be sure that the MAC 5000 System is connected to the modem as shown below



1. Select *Remote Query*.
2. Select a MUSE CV system.

   To retrieve ECGs from the default MUSE CV system, select *Connect*.

   To retrieve ECGs from a different MUSE CV system, select *Location*.

   - Select the pre-defined MUSE CV system.

   or

   - Select *Manual Dial* to retrieve ECGS from another MUSE system.
     - Press the return key.
     - Enter the telephone number of the receiving device.

- Press the return key.
- For *Type*, choose *MUSE Network*.
- Press the return key.

- Select *Connect*.

Select an ECG

1. Select an ECG by typing the patient's ID number.

   NOTE
   If you do not know the patient's ID number, type the patient's last name. Select your patient from the displayed list of patients.

2. Select *Return*. The system retrieves a directory of tests.
3. Select one or more tests.

Display or Print the ECG

To display the ECG, select *Display*. The selected ECG displays, along with the following options:

- *Medians* will display the medians for the displayed ECG.
- *Text* will display measurements and analysis for the displayed ECG.
- *Rhythm* will display rhythm information for the displayed ECG.
- *Next* will display the next selected ECG.
- *Return* will take you back to the directory of ECGs.

To print the ECG, select *Print*. The system retrieves, then prints, the test. The report format set up in System Setup is used.

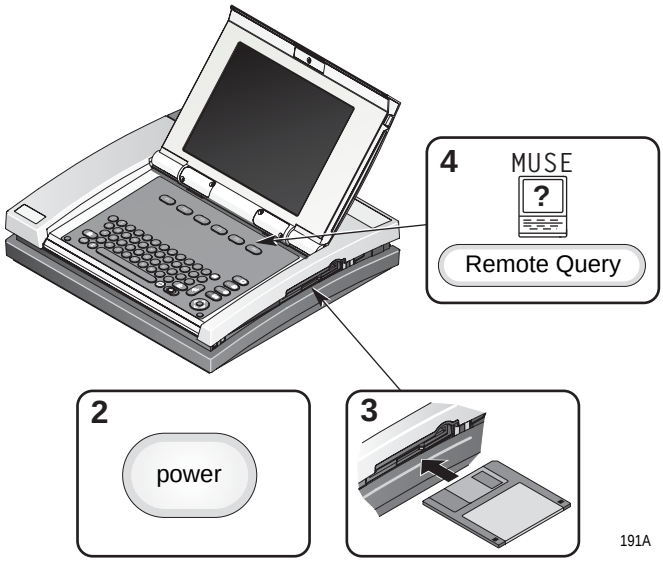
Retrieve Confirmed ECGs from a MUSE CV System via Wireless (Option)

NOTE

Before receiving an EGG report, be sure that the unit is powered on and that a diskette with sufficient available space is in the disk drive.

Connect and configure the MobileLink wireless option as described in the Mobile Installation and Troubleshooting Guide.

Performance of the MobileLink wireless system may vary due to changes in RF (radio frequency) properties of your site or environmental conditions. If you are experiencing intermittent connectivity in certain areas of your facility, it may be necessary to re-initiate the process of receiving from the MUSE system. You may also wish to consult your hospital IT department or your local GE Medical Systems Information Technologies networking professional regarding modification of your wireless LAN to improve system performance.



1. Select *Remote Query*.
2. Select a MUSE CV system.

   To retrieve ECGs from the default MUSE CV system, select *Connect*.

To retrieve ECGs from a different MUSE CV system, select *Location*.

- Select the pre-defined MUSE CV system.

or

- Select *Manual Dial* to retrieve ECGS from another MUSE system.
  - Press the return key.
  - Enter the telephone number of the receiving device.
  - Press the return key.
  - For *Type*, choose *MUSE Network*.
  - Press the return key.
- Select *Connect*.

3. Select an ECG by typing the patient's ID number.

   NOTE
   If you do not know the patient's ID number, type the patient's last name. Then select your patient from the displayed list of patients.

4. Select *Return*. The system retrieves a directory of tests.
5. Select one or more tests.

Display or Print the ECG

To display the ECG, select *Display*. The selected ECG displays, along with the following options:

- *Medians* will display the medians for the displayed ECG.
- *Text* will display measurements and analysis for the displayed ECG.
- *Rhythm* will display rhythm information for the displayed ECG.
- *Next* will display the next selected ECG.
- *Return* will take you back to the directory of ECGs.

To print the ECG, select *Print*. The system retrieves, then prints, the test. The report format set up in System Setup is used.

11 Editing an ECG

For your notes

Edit Demographic and Interpretive Data

NOTE

If storing ECGs in XML format, DO NOT allow editing ECGs at the MAC 5000. Changes made to ECGs during editing WILL NOT BE SAVED to the XML file.

NOTE

Before transmitting an EGG report, be sure that the unit is powered on and that a diskette containing the ECGs to be edited is in the disk drive.

1. Select *File Manager*. A list of ECG reports is displayed.
2. Select *Select*.
3. Highlight one or more ECG reports.
4. Select *Edit* to display the list of data that can be edited:

Editing Option	Special Considerations
Patient Information	Demographic data; can be edited without overreader password.
Medications	
Test Information	
ACI-TIPI Chest or Left Arm Pain	
ECG Measurements	Interpretive data; requires overreader password to edit. Editing interpretive data “confirms” the ECG.
Diagnostic Statements	
Return	Return to the previous menu.

Enter the Overreader Password

1. Type the overreader password
2. Press the return key.
3. Type the reviewer information.

4. Select *Return*.

Edit Resting, Pediatric, or Vector Loops Measurements

1. Select *ECG Measurements*.
2. Edit the data.
3. Select *Return*.

Edit Signal Averaged ECG Measurements

1. Select *HI-Res Measurements*.
2. The message *Edit the QRS or P-wave Onset?* displays.
3. Select *Yes* to edit the onset. Select *Onset*.

   or

   Select *No* to edit the offset. Select *Offset*.
4. Press the left or right arrows to increment or decrement the measurement.
5. Press the return key.

Edit Diagnostic Statements

Insert or Append an Acronym

Insert allows you to add text before the current statement. Append allows you to add to the end of the current line.

1. Select *Diagnostic Statements*.
2. Select a statement.
3. Select *Append* or *Insert*.
4. Type an acronym.
5. Press the return key.
6. Select *Return*.

Insert or Append Free Text

1. Select *Diagnostic Statements*.
2. Select a statement.
3. Select *Append* or *Insert*.
4. Type a statement.
5. Press the return key.
6. Select *Return*.

Move a Statement to a New Line

1. Select *Diagnostic Statements*.
2. Select a statement.
3. Select *New Lin*e.

Delete a Statement

1. Select *Diagnostic Statements*.
2. Select a statement.
3. Select *Delete*.

Join Two Statements

1. Select *Diagnostic Statements*.
2. Select a statement to join with the preceding statement.
3. Select *Join*.

Store the Edited ECG

1. Select *Return*.
2. Select *Return*.
3. The message *Save the edited file?* displays.
4. Select *Store* to save the edited file.

   or

   Press **esc** to discard the changes to the file.

12 Deleting an ECG

For your notes

Delete Stored ECGs

NOTE

Before deleting an EGG report, be sure that the unit is powered on and that a diskette containing the ECGs to be deleted is in the disk drive.

1. Select *File Manager*. A list of ECG reports is displayed.
2. Select *Select*.
3. Highlight one or more ECG reports.
4. Select *Delete* to delete the ECGs.
5. Type the System or Overread password.

   NOTE

   The System password should only be used by the system administrator or by qualified service personnel. All other users should use the Overread password.

6. The message *Delete these ECGs?* displays.
7. Select *Yes* to delete the selected ECG reports.

   or

   Select *No* to cancel this delete request. Select a different ECG report to delete.

Delete Stored ECG Orders (Option)

NOTE

Before deleting a stored ECG order, be sure that the unit is powered on and that a that a diskette containing the ECG orders to be deleted is in the disk drive.

1. Select *Ord Mgr Int* to enable the order manager interface.
2. Select *Load Orders.*
3. Select *Delete.* A list of orders displays.
4. Select an order to delete.

   NOTE

   Only orders that have not been completed may be deleted.

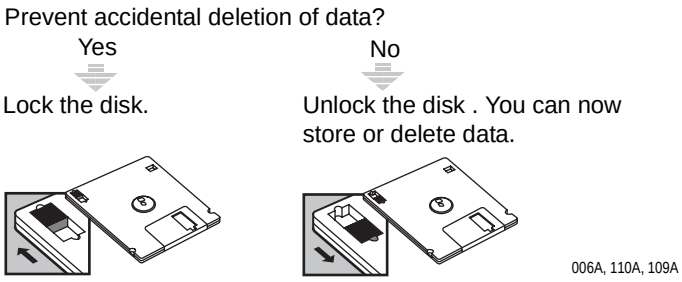
5. Select *Delete.* The system deletes the orders.
6. Enter the location(s) from which the device should retrieve the orders. Refer to "Receive Orders from a MUSE CV System (Option)" on page 4-6 for more information.
7. Select *Cancel* to return to the Main Menu.

13 Completing Other Tasks

For your notes

Prepare a Disk for Use

Lock and Unlock



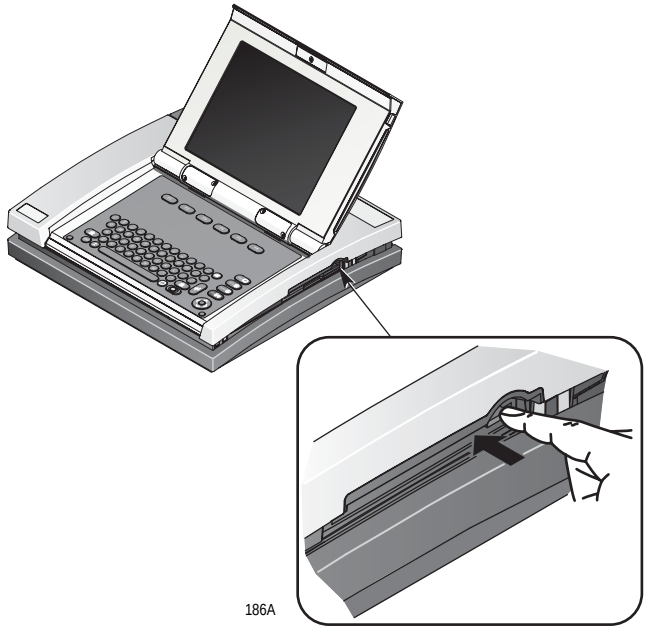
Format

NOTE

The system will automatically format an unformatted disk.

Before formatting a disk, be sure that the unit is powered on and that a disk is in the disk drive.

Eject a Disk From the Drive Slot



Press the button just above the drive slot to eject the disk.

Display Stored ECGs

NOTE
Be sure that the unit is powered on and that a disk containing the ECGs to be displayed is in the disk drive.

1. Select *File Manager* to open the list of stored ECGs to view.
2. Select *Select* to display a list of available ECGs.
3. Highlight one or more ECGs to display.
4. Select *Display*.

NOTE
Medians, Rhythm, and *Text* functions are not available for the signal averaged ECGs.

Print the ECG

Select *Print* to print the selected ECGs.

Display Medians or Rhythm Data

Select *Medians* to display medians information for the selected ECGs.

or

Select *Rhythm* to display rhythm information for the selected ECGs.

Display Measurement and Analysis Statements

Select *Text* to display measurement and analysis statements (text) information for the selected ECGs.

Display the Next Selected ECG

Select *Next* to display the next selected ECG.

Return to the Main Menu

Select *Return* to return to the Main Menu from the current screen.

Display ECGs From a Different Disk

To display ECGs from a different disk, insert the appropriate disk in the disk drive.

1. Prss **esc**.
2. Press *New Disk*.

14 System Setup

For your notes

Using the System Setup Function

Select the System Setup Function

1. Select *System Setup* to access the system setup function.
2. Enter the system setup password.
3. Verify that the password is correct. Retype the password if necessary.
4. Select a menu function.

Define the System Parameters

Use the information contained in this chapter to define your system's operating parameters.

Save Your Changes

After making a change to the system's operating parameters, save your changes:

1. Select *Save Setup*.
2. Select *To System*.
3. Select *Main Menu*.

Program the System to Automatically Do a Task

Power Up the System into a Specific Resting Function

1. Within the system setup function, select *Basic System*.
2. Select *Power Up Options.*
3. Select the function the system always uses when you power on your system.
4. Select *Return*.

Preview ECG Data Before Analysis

Preview shows you the ECG on screen before it is printed or stored. After the ECG is displayed, select *Continue* to print or store the ECG, or *Cancel* to discard it.

1. Within the system setup function, select *ECG*.
2. Select *ECG Analysis.*
3. In the *Preview before analysis* before field, select *Yes*.
4. Select *Return*.

To Print a Resting ECG Report

1. Within the system setup function, select *ECG*.
2. Select the Resting ECG function for which the system should automatically print reports:
   - Resting ECG Reports
   - Pediatric ECG Reports
   - 15 Lead Reports
   - Vector Loops Reports
3. Select *Unconfirmed Reports*.
4. Select the type and quantity of formats printed.

5. Select *Return*.

Print a Signal Averaged ECG Report

1. Within the system setup function, select *Hi-Res*.
2. Select the type of format and quantity to be printed.
3. Select *Return*.

Store an ECG

1. Within the system setup function, select *ECG*.
2. Select *ECG Analysis*.
3. Select the type of ECGs stored.
4. Select *Return*.

Transmit an ECG

NOTE
Before programming your system to automatically transmit an ECG, you must define the receiving device and it's default location. See "Transmission" on page 14-11 to define the transmission parameters of the default receiving device

1. Within the system setup function, select ECG.
2. Select *ECG Analysis*.
3. Select the type of ECGs transmitted. In the *Auto ECG transmission* field select one:
   - *All ECGs*
   - *No ECGs*
   - *Only ABNORMAL ECGs*
4. Select *Return*.

Enable or Disable the ACI-TIPI Option

1. Within the system setup function, select ECG.
2. Select *ECG Analysis*.

3. In the Enable ACI-TIPI field, select *Yes* to enable the ACI-TIPI option; select *No* to disable the ACI-TIPI option.
4. Select *Return*.

Define the Basic System Setup

Miscellaneous Setup

1. Within the system setup function, select *Basic System*.
2. Select *Miscellaneous Setup* to define your system's basic set up items. Miscellaneous Setup menu items are defined in the table below.

Miscellaneous Setup	
Item	**Description**
Institution name	Type the name of your hospital, clinic, etc. as you want it to appear on printed reports. On most reports the institution name appears at the top.
Text entry	Select *Uppercase* only to type text in uppercase letters. Select *Upper and lowercase* to type text in upper and lowercase letters.
Speaker volume	Select *Low* to set the system's speaker to low volume. Select *High* to set the system's speaker to high volume.
External video port	Select *Option 1* to enable this port. Most remote monitors function using *Option 1*. Otherwise, select *Option 2*.
Information line	Select *Yes* to enable the help information line on the screen.
Cart number	Type a number that uniquely identifies this system.
Site number	Type a number from 1-32 to identify where the data will be stored in the MUSE CV system. The *Site number* used must be compatible with the site number for the MUSE CV system to which the MAC 5000 device is communicating.
Location number	Type a number to identify the location of this system to a MUSE CV system. Use a value from 1-99 for MUSE CV systems using software version 002B-004 or 3A/CLM-1B. Use a value from 0-599 for a MUSE CV system using software version 4A or later. The *Location number* used must be compatible with the location number for the MUSE CV system to which the MAC 5000 device is communicating.
File Manager sort	Select the sorting method your system uses to display stored ECGs.
Delete after transmit	Select *Yes* to delete an ECG after transmitting it to a receiving device.
Text on bottom	Select *Yes* to print the ECG test information on the bottom of the ECG reports.

Miscellaneous Setup	
Item	**Description**
Print barcodes	Select *Yes* if you want the patient information printed in a barcode format on printed reports.
Automatic Shutdown	Type a number of minutes (x) greater than zero to enable the battery conservation mode. If a key is not pressed within (x) minutes, your system will automatically power off. Only patient data is saved when the system powers off.
Serial power always on	Select *Yes* to enable continuous power to the serial ports.
System password	Type a 6-character password that allows you to access the *System Setup* and *Delete* functions. The default *System password* is system. Keep track of all assigned passwords.
Overread password	Type a 6-character password that allows you to access the *Delete* function. The default *Overread password* is ovread. Keep track of all assigned passwords.
Device password	Type a 6-character password. The MAC 5000 has no default *Device Password*. If a *Device Password* is entered here, users will be required to enter it in order to use the system. See “Appendix B, Troubleshooting” for *Device Password* override. Keep track of all assigned passwords.

Patient Questions

1. Within the system setup function, select *Basic System*.
2. Select *Patient Questions* to define what patient prompts appear when you select *Patient Data* in the Resting ECG application. *Patient Questions* items are defined in the table below.

Patient Questions	
Item	**Description**
ID Required	Select *Yes* to require the user to enter the patient’s identification number before an ECG can be recorded.
ID length	Type the number of alpha-numeric characters used in the patient identification number. Use from 3-16 characters. Use a format that is compatible with the MUSE CV system to which the MAC 5000 device is communicating.

Patient Questions	
Item	**Description**
Age	Choose the method to enter the patient's age: ■ Select *Date of birth* to enter age in day-month-year-order. With this setting, the patient's date of birth will be printed. ■ Select *Age in years* to enter age in years, months, weeks, days, or hours. With this setting, the patient's age in years, monthes, weeks, days, or hours will be printed. In addition to affecting the method the patient's age is asked in the patient information screen, this selection affects the way the age/date of birth is printed on the report if the information is transferred from the card reader or order manager.
Gender	Select *Yes* to display a prompt asking whether the patient is male or female.
Height	Select *Yes* to display a prompt asking the patient's height.
Weight	Select *Yes* to display a prompt asking the patient's weight.
Height/Weight in	Choose the units of measurement defining the patient's weight: Select *in./lb.* to enter the patient's height and weight in inches and pounds. Select *cm./kg.* to enter the patient's height and weight in centimeters and kilograms.
Race	Select *Yes* to display a prompt asking the patient's race. Our equipment contains several fields which can be filled in before performing an ECG. Some of these fields must be filled in before performing an exam, some are optional and therefore left to the user to assess whether they are needed to perform the exam. A field *RACE* is one of these optional fields. It has been acknowledged by the medical profession as useful to analyze some pathologies. You should be aware that, in some jurisdictions, the processing of data revealing an individual's racial origin is subject to legal requirements, such as obtaining the patient's prior consent. If you elect to collect this type of data, it is your responsibility to ensure that you comply with all applicable legal requirements.
Blood pressure	Select *Yes* to display a prompt asking the patient's systolic and diastolic blood pressures.
Medications	Select *Yes* to display a prompt asking what medications a patient is taking.
Referred by name and number	Select *Yes* to display a prompt asking who referred the patient. Use the numbers that are compatible with those used for the MUSE CV system to which the MAC 5000 device is communicating.
Test indication	Select *Yes* to display a prompt asking the reason for the test.
Patient History	Select *Yes* to display a prompt asking the patient's history.

Patient Questions	
Item	**Description**
Technician	Select *Yes* to display a prompt asking the name of the technician who recorded the ECG. Use the technician identifiers that are compatible with those used for the MUSE CV system to which the MAC 5000 device is communicating.
Technician Required	Select *Yes* to require entry of the name/identifier of the technician who recorded the ECG.
Location	Select *Yes* to display a prompt asking the this system's location number. Use the location numbers that are compatible with those used for the MUSE CV system to which the MAC 5000 device is communicating.
Room number	Select *Yes* to display a prompt asking the patient's room number.
Options	Select *Yes* to prompt the user to enter an options number for this ECG. You can define this number to mean whatever you want.
Order number	Select *Yes* to prompt the user to enter an order number for this ECG.
Secondary ID	Select *Yes* to prompt the user to enter a second ID for this ECG.
Extra questions	Prompt — Type the text you want for the patient question. Select the type of response you want entered for the patient question: ■ Select *Numbers and letters* to answer the prompt using numbers and letters. ■ Select *Numbers only* to answer the prompt using only numbers. ■ Select *Yes* or *No* to answer the prompt using either yes or no.

Screen Colors

1. Within the system setup function, select *Basic System*.
2. Select *Screen Colors* to display one of three color options.

Screen Colors	
Item	**Description**
Screen colors	Define the screen colors you want the system to display. Select *Monochrome* to view white screen elements. Select *Option 1* to view white, green, yellow, and red screen elements. Select *Option 2* to view white, yellow, and red screen elements.

Transmission

1. Within the system setup function, select Basic System.
2. Select *Transmission* to define your system's transmission parameters. Transmission menu items are defined in the table below.

Transmission	
Item	**Description**
Modem Speaker	Choose when you want to hear the modem tones: Select *On* to hear the modem tones. Select *Off* to prevent hearing the modem tones. Select *Dialing only* to hear the modem tones while your system dials a telephone number.
Dialtone required	Select *Yes* when the system is connected to telephone lines that have a dialtone.
Dialing method	Select the dialing method used by your telephone line.
Fax error correction	Select *Yes* if the facsimile machine to which you transmit ECGs uses an error correction factor.
, - Two second pause	Type a comma (,) in a telephone number to create a 2-second pause. This can be used to wait for a dialtone. For example, the telephone number 9,3216788 will have a 2-second pause between the numbers 9 and 3, as when dialing an outside line.
Phone number	Type from one to six telephone numbers(s) you frequently transmit to.
Location	Type the name of location(s) you transmit to.
Type	Choose the type of modem your system uses to transmit data to a receiving device. Select the *MUSE NETWORK* modem to transmit to another cart or to the MUSE CV system. Select *Fax machine* to transmit to facsimile machine.
Use IR for serial line	Select *Yes* to enable the local infrared communication.

Transmission	
Item	**Description**
Serial line baud rate	Select *9600* baud rate to transmit or receive data between another MAC 5000 or a MUSE CV system. Other serial line baud rates are available for communicating with other devices.
Default Location	Select the default receiving device to which your system transmits ECGs. ■ To transmit by local infrared communication or by local cable, select *Serial line (MUSE)*. ■ To transmit ASCII data to the serial port, select *Serial line (ASCII out)*. ■ To transmit XML data to the serial port, select *Serial line (XML out).* The PC which receives XML data through the serial line must be running a terminal emulator program (for example, HyperTerminal)

Date and Time

1. Within the system setup function, select *Basic System*.
2. Select *Date and Time* to set the date and time that appears on the ECG reports. Date and Time options are defined in the table below.

Date and Time	
Item	**Description**
Current date	Enter the current date: Type the day. Select the month. Type the year.
Current time	Enter the current time: Type the hour. Type the minutes.

Language

1. Within the system setup function, select *Basic System*.
2. Select *Language* to choose the language displayed on screen and in ECG reports

Language	
Item	**Description**
Select new language	Select the language of displayed or printed data. Power the system off then on to view the new language.

Power Up Options

1. Within the system setup function, select *Basic System*.
2. Select *Power Up Options* to program your system to power up into either the resting, pediatric, vector loops, or 15 lead (option) ECG function.

Power Up Options	
Item	**Description**
Power Up Application	Select the resting ECG function you want your system to start up in every time you power on the system.

Order Manager Interface

1. Within the system setup function, select *Basic System*.
2. Select *Order Manager Interface* to acquire, store, and print ECG orders received from a MUSE CV system. The MUSE CV system must use a Hospital Information System (HIS).

Order Manager Interface	
Item	**Description**
Initial sort value	Select how you want to sort displayed ECG orders.
Create orders locally	Select *Yes* to allow ECG orders to be entered manually into the system.

PS/2 Port

1. Within the system setup function, select *Basic System*.
2. Select *PS/2 Port Select* to select the optional card reader or bar code reader. *PS/2 Port Select* options are defined in the table below.

PS/2 Port	
Item	**Description**
PS/2 Port Device	Select the input device connected to the PS/2 port (*Keyboard*, *Card Reader*, or *Bar Code Reader*). See "Card Reader Option Setup" on page 14-31 for details on how to configure the card reader. See "Bar Code Reader Option Setup" on page 14-33 for details on how to configure the bar code reader.
Card Reader Configuration	*None*, *Manual*, or Automatic (See "Card Reader Option Setup" on page 14-31 for more information.)
Bar Code Configuration	*None*, *Manual*, or Automatic (See "Bar Code Reader Option Setup" on page 14-33 for more information.)

Define the ECG Setup

ECG Acquisition

1. Within the system setup function, select *ECG*.
2. Select *ECG Acquisition* to define the ECG acquisition parameters. *ECG Acquisition* options are defined in the table below.

ECG Acquisition	
Item	**Description**
Baseline roll filter	Use this filter to remove baseline sway. The higher the setting, the more the filter smooths out a wandering baseline. This filter does NOT distort the ST segment displayed on the ECG reports.
AC filter	Use this filter to remove AC line artifact.
Disable auto gain check	Select *No*, to display a prompt after the user presses **ECG** if the gain of the recorded ECG data is either too high or too low. The user can adjust the gain.
Disable lead off check	Select *No* to display a screen message when the system detects a disconnected leadwire.
Pacemaker pulse enhancer	Select *Yes* to detect very small pacemaker pulses. However, when *Pacemaker pulse enhancer* is on, the system is very sensitive, and should NOT be close to equipment emitting high frequency radiation. High frequency radiation can interfere with pacemaker pulse detection and normal ECG acquisition.
Baseline wander warning[1]	Select *Yes* to display a screen message when the system detects a wandering baseline.
Muscle tremor warning1	Select *Yes* to display a screen message when the system detects muscle tremor.
AC noise level warning1	Select *Yes* to program the system to check for powerline interference when recording an ECG.
Hookup Advisor	Select *Yes* to enable the Hookup Advisor option, which monitors the quality of resting ECG signals, and is available for resting, 15 lead, pediatric, vector loops, and Master;s Step ECG measurements.

ECG Acquisition	
Item	**Description**
Prompt level	If Hookup Advisor is enabled, set the sensitivity at which the system will prompt users regarding patient hookup quality. Choices are *Yellow* (default), *Red*, and *Never*. ■ When the *Prompt* level is set to *Yellow*, the expected behavior for both yellow and red lead quality situations is as follows: ◆ Users are prompted to *Continue* or *Cancel* the recording. ◆ The statement****Poor data quality, interpretation may be adversely affected* is automatically printed on the report. ■ When the *Prompt* level is set to *Red*, the expected behavior for red lead quality situations is as follows: ◆ Users are prompted to*Continue* or *Cancel* the recording. ◆ The statement****Poor data quality, interpretation may be adversely affected* is automatically printed on the report. ■ When the *Prompt* level is set to *Never*, the expected behavior is as follows: ◆ The prompt does not display on the device for either yellow or red lead quality situations. ◆ The statement****Poor data quality, interpretation may be adversely affected* is automatically printed on the report for red lead quality situations. The *Prompt level* control is not active if the Hookup Advisor option is turned off. **NOTE** If *Hookup Advisor* and *Preview before analysis* options are both on, this setting is disregarded because any lead quality message will be displayed when the user is prompted to continue in the preview screen.
Pre-acquisition	Select *Yes* to begin acquiring ECG data as soon as the leadwires are connected to a patient. The system does not wait until the user presses **ecg** before it starts acquiring ECG data. The latest 10 seconds of ECG data is ready for analysis when *Pre-acquisition* is turned on.

1. If Hookup Advisor is turned ON, these options do nothing in modes affected by Hookup Advisor.

ECG Analysis

1. Within the system setup function, select *ECG*.
2. Select *ECG Analysis* to define the ECG analysis parameters. *ECG Analysis* options are defined in the table below.

ECG Analysis	
Item	**Description**
Preview before analysis	Select *Yes* to allow the user to always preview a recorded ECG before the system analyzes the data (resting, pediatric, 15-lead, and vector loops only).
Screening criteria	Select *Yes* to prevent specific 12SL analysis statements from appearing on ECG reports. See Appendix C to identify these statements.
Suppress NORMAL statement	Select *Yes* to prevent the *Normal ECG* 12SL analysis statement from appearing on printed, stored, and transmitted ECG reports.
Suppress ABNORMAL and BORDERLINE statements	Select *Yes* to prevent the *Abnormal ECG* and *Borderline ECG* 12SL analysis statements from appearing on printed, stored, and transmitted ECGs.
Storage format	Choose the data compression format of the ECGs stored on a MUSE CV system: 250Hz (not available with ACI-TIPI option) ■ Select *500Hz* (*MUSE Network*) if sending ECGs to a MUSE CV system using MUSE software versions 004A or later. ■ Select *500Hz DVS (MUSE Network)* to store ECGs so that they can be reprinted at the same full original resolution by the receiving device. The MUSE CV system must be using software version 5D.04 or later.
Store XML format	Select *Yes* to automatically save each ECG in XML format in addition to the standard GE proprietary format. XML files are stored to the following path: **a:\XML*.XML**. Use a blank disk to save the XML output. ■ If storing ECGs in XML format, DO NOT allow editing ECGs at the MAC 5000. Changes made to ECGs during editing WILL NOT BE SAVED to the XML file. ■ Except for the XML suffix, the name of the XML file is the same as the name of the ECG file. ■ When this option is selected, the floppy disk will fill up more quickly due to the size of the XML files.
Auto ECG storage	Choose the ECGs you want your system to automatically store to a disk: ■ Select *All ECGs* to automatically store a recorded ECG. ■ Select *No ECGs* to disable automatic storage of a recorded ECG. ■ Select *Only ABNORMAL ECGs* to automatically store a recorded ECG that the 12SL analysis program has classified as abnormal.

ECG Analysis	
Item	**Description**
Auto ECG transmission	Choose the ECGs you want your system to automatically transmit: ■ Select *All ECGS* to automatically transmit all recorded ECG upon completion. ■ Select *No ECGS* to disable automatic transmission of a recorded ECG. ■ Select *Only ABNORMAL ECGs* to automatically transmit a recorded ECG that the 12SL analysis program has classified as abnormal.
Enable ACI-TIPI	Select *No* to disable the ACI-TIPI function. Select *Yes* to enable the ACI-TIPI function. This is an option and might not be installed on your unit.

Patient Questions

1. Within the system setup function, select *ECG*.
2. Select *Patient Questions* to define two alpha-numeric patient data prompts.

Patient Questions	
Item	**Description**
Prompt	Type the text you want for the patient question.
Type	Select the type of response you want entered for the patient question. Select *Numbers and letters* to answer the prompt using numbers and letters. Select *Numbers only* to answer the prompt using numbers. Select *Yes* or *No* to answer the prompt using either yes or no.

Writer Setup

1. Within the system setup function, select *ECG*.
2. Select *Writer Setup* to change the writer's default speed, gain, and filter settings.

Writer Setup	
Item	**Description**
Speed	Select the writer's default speed setting in millimeters per second.
Gain	Select the writer's default gain setting. For the *10/5* setting, limb leads appear at 10 mm/mV and precordial leads appear at 5 mm/mV.
Filter	Select the writer's default filter setting. The screen filter is always set to 40 Hz.

Resting, Pediatric, 15 Lead, and Vector Loops ECG Reports

1. Within the system setup function, select ECG.
2. Select this function to:

- Specify the leads displayed on reports. Refer to Table , "Report Leads," on page 14-20.
- Choose the unconfirmed and confirmed report formats. Refer to Table , "Confirmed Reports," on page 14-20 and to Table , "Unconfirmed Reports," on page 14-21.
- Identify the three auxiliary leads used to acquire a 15 lead ECG using the *15 lead ECG* function (option). Refer to Table , "Extra Leads (15 Lead ECG Option Only)," on page 14-21.
- Set up the parameters specific to *Vector Loops Reports* (option). Refer to Table , "Vector Loops (Vector Loops Option Only)," on page 14-21.

Report Leads	
Item	**Description**
Standard leads	Select the standard leads you want to appear on the ECG reports. When you change a channel's lead, the new lead appears on all the ECG reports displaying that channel.
Rhythm reports	Choose the type of data displayed in the *Rhythm* reports. Select *Real time* to print current ECG data on the *Rhythm* reports. This allows you to print the data you see on the screen. Select *10 sec delayed* to print ECG data delayed by 10 seconds.
Rhythm leads	Choose a lead option for each group to determine the rhythm leads that print when you select the *rhythm* key in an application. The six defined groups make up the display list when you select *Leads in the Resting, Pediatric, 15 Lead,* or *Vector Loops Application*. Select *3 leads* to define which three leads in a three lead Rhythm report print. Select *6 leads* to define which six leads in a six lead Rhythm report print. Select *All leads* to display and print 10 seconds of data for 12 (or 15) leads. Select *Lead Check* to display and print real time data for each of the 12 (or 15) leads. Select *Lead Placement* to display and print real time data for each of the 12 (or 15) leads and to display the chest electrode placement.
Autorhythm	Select the group of *Rhythm leads* printed in the *Autorhythm* report.
RMR/CGR/ extra rhythm leads	Select the rhythm lead(s) you want printed in the *RMR* and *CGR* reports. When you change a rhythm lead, the new lead appears on all reports displaying that lead. For example, if you select *V5* for *RMR/CGR/extra rhythm lead 1*, then the *V5* waveform appears on all reports that include *RMR/CGR/extra rhythm lead 1*.
Swedish format rhythm leads	Select the rhythm lead(s) you want printed in the *Swedish format* reports. When you change a rhythm lead, the new lead appears on all reports displaying that lead. For example, if you select *V5* for the *Swedish format rhythm lead 1*, then the *V5* waveform appears on all reports that include *Swedish format rhythm lead 1*.

Confirmed Reports	
Item	**Description**
Report formats	Choose the report formats you want to print after an ECG has been confirmed. ■ Select whether you want the report to print with or without interpretation (12SL analysis statements). ■ Enter the number of copies you want to print for each report (0 - 10 copies).

Unconfirmed Reports	
Item	**Description**
Normal ECG Reports	Choose the report formats your system automatically prints after you press ECG. ■ Select whether you want the report to print with or without interpretation (12SL analysis statements). ■ Enter the number of copies you want to print for each report (0 - 10 copies).
Abnormal ECG Reports	Choose the report formats your system automatically prints when an abnormal ECG is detected. ■ Select whether you want the report to print with or without interpretation (12SL analysis statements). ■ Type in the number of copies you want printed.
Confirmation text	Choose the text that appears on an ECG report that indicates the status of the ECG. ■ Select *Unconfirmed* to indicate that the ECG report is not confirmed by a physician. Once an ECG is confirmed, the word *Confirmed* appears on the ECG report. ■ Select *Reviewed by* to display the reviewer's name on a confirmed ECG report. If the ECG report is not confirmed, then no name appears.

Extra Leads (15 Lead ECG Option Only)	
Item	**Description**
Lead Set	Choose the three additional leads used. You can: ■ Select one of the pre-defined lead sets, or ■ Select *Custom 3* to define the electrode positions of A1, A2, and A3.

Vector Loops (Vector Loops Option Only)	
Item	**Description**
Number of copies	Type a value between 0 and 10 for the number of copies you want to print for this report format.
Main loop gain	Select a default setting.
Lead Z display	Select a default setting.
Sagittal plane	Select a default setting.

Analog Outputs

1. Within the system setup function, select *ECG*.
2. Select *Analog Outputs* to define the system's output signals when connecting additional equipment to the system. *Analog Outputs* options are defined in the table below.

Analog Outputs	
Item	**Description**
Fast Analog Output	Select *Not Used, I, II,* or *V1-V6*.
TTL Output	Select *Not Used* or *QRS Detect* to define *TTL Output*.
Polarity	Select *Positive* or *Negative* to define *TTL Output* polarity.
Width	Type a value between 4 and 48 to define *TTL Output* signal width in milliseconds.
Delay	Type a value between 0 and 100 to set a delay in milliseconds for the *TTL Output* QRS detector signal.
QRS Beep	Select *On* to hear a beep for each QRS complex.

Define the Exercise Test Setup (Option)

Miscellaneous Setup

1. Within the system setup function, select *Exercise Test*.
2. Select *Miscellaneous Setup* to define your system's basic exercise test set up items. Miscellaneous Setup items for exercise testing are defined in the table below.

Micellaneous Setup -- Exercise Testing	
Item	**Description**
Timeout Interval	The time it takes for a menu or prompt to "disappear" from the screen when it is not being used. You may type in a value between 15 and 600 seconds.
Cubic Spline	Select Yes to turn on the baseline control option.
Event names:	This allows you to create a list of event names, any of which may be selected to label a patient episode during an exercise test.
Reason for Termination:	This allows you to create a list of reasons for terminating the exercise test. Select the appropriate reason at the end of the test.

Patient Data/Questions

1. Within the system setup function, select *Exercise Test*.
2. Select *Patient Questions* to configure the system to require entry of the patient's maximum predicted heart rate, the patient's target heart rate, and to define two Yes/No and alpha-numeric patient data prompts.

Patient Questions -- Exercise Testing	
Item	**Description**
Max Pred HR	Select *Yes* to require the patient's maximum predicted heart rate to be entered.

Patient Questions -- Exercise Testing	
Item	**Description**
Target Heart Rate	Select *Yes* to require the patient's target heart rate. Enter the percentage of maximum predicted heart rate.
Extra questions	In addition to the patient questions defined under *Basic System*, there are 2 patient data prompts that you can define. Each of the prompts can be answered in 3 ways: *Numbers and letters* = the answer to the prompt can be made up of numbers and letters. *Numbers only* = the answer to the prompt can only be in numbers. *Yes* or *No* = the answer to the prompt must be yes or no.

Writer Setup

1. Within the system setup function, select Exercise Test.
2. Select *Writer Setup* to change the writer's default speed, gain, and filter settings. You can also enable or disable reporting tools.

Writer Setup -- Exercise Testing	
Item	**Description**
Speed	Select the writer's default speed setting in millimeters per second.
Gain	Select the writer's default gain setting. For the *10/5* setting, limb leads appear at 10 mm/mV and precordial leads appear at 5 mm/mV.
Filter	Select the writer's default filter setting. The screen filter is always set to 40 Hz.
Arrhythmia Doc.	Select *On* to automatically print a report when an arrhythmia occurs during the exercise test.
Tic marks	Select *Yes* to add tic marks on the E, J, and J-plus-a-measurement points.
ST Measurements	Select *Yes* to enable screen and writer ST measurements.
Post J	Enter a value between 0 and 200 for the value(in milliseconds) after the J point, where the ST measurement is to be taken.
Writer	ON / OFF

12 and 15 Lead Exercise Reports

1. Within the system setup function, select *Exercise Test*.
2. Select *12 Lead Exercise* or *15 Lead Exercise* to:

- Identify the three auxiliary leads used to acquire a 15 lead exercise ECG using the *15 lead ECG* function (option). Refer to Table , "Extra Leads (15 Lead ECG Option Only) -- Exercise Testing," on page 14-25.
- Specify the leads displayed on exercise reports. Refer to Table , "Report Leads -- Exercise Testing," on page 14-25.

Extra Leads (15 Lead ECG Option Only) -- Exercise Testing	
Item	**Description**
Lead Set	Choose the three additional leads used. You can: select one of the pre-defined lead sets, or select *Custom 3* to define the electrode positions of A1, A2, and A3.

Report Leads -- Exercise Testing	
Item	**Description**
Standard leads	Select the standard leads you want to appear on the ECG reports. When you change a channel's lead, the new lead appears on all the ECG reports displaying that channel.
Rhythm reports	Choose the type of data displayed in the *Rhythm* reports. Select *Real time* to print current ECG data on the *Rhythm* reports. This allows you to print the data you see on the screen. Select *10 sec delayed* to print ECG data delayed by 10 seconds.
Rhythm leads	Choose a lead option for each group to determine the rhythm leads that print when you select the *rhythm* key within an application. The six defined groups make up the display list when you select *Leads in the Resting, Pediatric, 15 Lead,* or *Vector Loops* Application. ■ Select *3 leads* to define which three leads in a three lead Rhythm report print. ■ Select *6 leads* to define which six leads in a six lead Rhythm report print. ■ Select *All leads* to display and print 10 seconds of data for 12 (or 15) leads. ■ Select *Lead Check* to display and print real time data for each of the 12 (or 15) leads. ■ Select *Lead Placement* to display and print real time data for each of the 12 (or 15) leads and to display the chest electrode placement.
Autorhythm	Select the group of *Rhythm leads* printed in the *Autorhythm* report.

Report Leads -- Exercise Testing	
Item	**Description**
RMR/CGR/ extra rhythm leads	Select the rhythm lead(s) you want printed in the *RMR* and *CGR* reports. When you change a rhythm lead, the new lead appears on all reports displaying that lead. For example, if you select *V5* for *RMR/CGR/extra rhythm lead 1*, then the *V5* waveform appears on all reports that include *RMR/CGR/extra rhythm lead 1*.
Swedish format rhythm leads	Select the rhythm lead(s) you want printed in the *Swedish format* reports. When you change a rhythm lead, the new lead appears on all reports displaying that lead. For example, if you select *V5* for the *Swedish format rhythm lead 1*, then the *V5* waveform appears on all reports that include *Swedish format rhythm lead 1*. When printing or storing 3 lead median or trend reports, the first three Swedish format rhythm leads are used. When printing or storing 6 lead median reports, all six of the Swedish format rhythm leads are used.
Median	Select the median lead you want printed in the reports. Choices are *Fixed* or *Scan*. Select *Fixed* to manually designate the median lead.

Exercise Reports

1. Within the system setup function, select *Exercise Test*.
2. Select *Exercise Reports* to choose the report you wish to print with the 12-lead or optional 15-lead exercise tests.

Final Report

1. Within the system setup function, select *Exercise Test*.
2. Select *Final Report* to set up the types of reports you want to print on the final report. These reports print during the *TEST-END* phase.

Final Report -- Exercise Testing	
Item	**Description**
Storage Option	Select *Store strips and final report, Store final report only,* or *No storage of test data* to store in-test strips or final reports to diskette.
Final Report Preview	Select *No Preview Report, Summary Report, Tabular Report, Selected Medians, Trend & Medians, Median Report,* or *Trend Report* format to print as a preview report before *Reason for Termination* and *Comments* are entered and all final reports are printed at test end.
Summary Report	Enter the number of copies to be printed. Select either *Resting and Max ST Medians* or *Resting and Peak Exercise Medians* format for the final summary report.
Tabular Report	Enter the number of copies to be printed.
Selected Medians	Enter the number of copies to be printed.
Trend & Medians	Enter the number of copies to be printed.
Median Report Leads	Enter the number of copies to be printed. Then, select either *3, 6,* or *All* leads for the median report. *All* means that the report has either 12 or 15 leads. Fifteen leads appear only if extra leads — such as X, Y, or Z — were chosen in *Basic System* setup.
Trend Report Leads	Enter the number of copies to be printed. Then, select either *3* or *All* leads for the trend report.
ST-HR Loops	Enter the number of copies to be printed.
ST/HR Report	Enter the number of copies to be printed for the ST/Heart Rate Slope report.

Screen

1. Within the system setup function, select *Exercise Test*.
2. Select *Screen* to define how your exercise ECGs are displayed on your screen.

Screen -- Exercise Testing	
Item	**Description**
Display Rhythm Medians	Select *Yes* to display a median complex on the screen in front of Rhythm Lead 1, 2, and 3 during an exercise test.
Screen Filter	Select 20 or 40 Hz to set the screen filter.

Inputs / Outputs

1. Within the system setup function, select *Exercise Test*.
2. Select *Inputs / Outputs* when you connect additional equipment, like an ergometer, to your MAC 5000 system.

Inputs / Outputs	
Item	**Description**
Slow Analog Output	Select *Not Used, DC Heart Rate, Workload, Speed (x1), Speed (x3),* or select *Grade* to define DC heart rate, ergometer workload, treadmill speed, or treadmill grade. If using exercise protocols for an ergometer or an analog treadmill (see Chapter 7, Chapter 7, "Editing Protocols") you must configure the slow and fast analog output properly to control the workload device. For ergometers the analog output should be configured for workload, for analog treadmills the analog outputs should be configured for speed and grade.
Fast Analog Output	Select *Not Used, DC Heart Rate, Workload, Speed (x1), Speed (x3), Grade,* or select one of the following leads: *I, II, V1, V2, V3, V4, V5,* or *V6*. Attach an acquisition module to the MAC 5000 system in order to use this output.
Blood Pressure	Select *Manual, Ergoline Ergometer, Suntech,* or *Nipon-Colin*. If selecting the Suntech blood pressure device, the blood pressure device must be configured to use the Ergoline emulation mode. (See the Suntech blood pressure device Operators Manual.)
TTL Output	Select *Not Used, QRS Detect,* or *BP Prompt* to define *TTL Output*. If selecting any of the external blood pressure devices, the TTL output must be configured to provide a QRS Trigger that meets the specifications of the blood pressure device. (See the blood pressure device Operators Manual for TTL trigger specifications.)
Polarity	Select *Positive* or *Negative* to set *TTL Output* polarity.

Inputs / Outputs	
Item	**Description**
Width	Enter a value from 4–48 milliseconds to define *TTL Output* signal width.
Delay	Type a value between 0 and 100 to set a delay in milliseconds for the *TTL Output* QRS detector signal.
QRS Beep	Select *On* to hear a beep for each QRS complex.

Define the Signal Averaged ECG Setup (Option)

Within the system setup function, select *Hi-Res* to define the HI-RES and PHi-Res signal averaged ECG program (options).

HI-RES and PHi-Res signal averaged ECG program (options)	
Item	**Description**
Analysis filter	Select the analysis filter you want to use. GE Medical Systems *Information Technologies* recommends using an analysis filter of *40-250Hz*.
Averaging target	Select the method to average the target.
Target Beat Count	Type a value from 1 to 999. GE Medical Systems *Information Technologies* recommends averaging to a minimum of 250 beats.
Target Noise Level	Type a value from 0.1 to 1.0µV. GE Medical Systems *Information Technologies* recommends averaging to a noise level of 0.3µV.
Correlation Threshold	Select the degree of correlation threshold. GE Medical Systems *Information Technologies* recommends the *Very High* setting.
Final Report	Type a value from 0 to 10 for the number of copies you want to print for each report format.
Prompt	Type the text you want for the patient question.
Type	Select the type of response you want entered for the patient question. Select *Numbers and letters* to answer the prompt using numbers and letters. Select *Numbers only* to answer the prompt using numbers. Select *Yes* or *No* to answer the prompt using either yes or no.

Card Reader Option Setup

NOTE

When configured for card reader, the system will prompt you to slide the patient card when you select *Patient Information*. If no patient card is available, press **esc** to enter the patient information manually.

Automatic Configuration of Card Reader

1. Obtain a configuration card. For details on creating a configuration card, see "Creating Bar Codes and Magnetic Cards" on page 14-34.
2. With the card reader properly mounted, connect it to the **A** port on the back of the MAC 5000.
3. From the *Main Menu*, select *System Setup* → *Basic System* → *PS/2 Port Select* → *PS/2 Port Device* → *Card Reader* → *Return*.
4. Press **esc** when the *Manual Card Reader Configuration* window appears. The items in this window will be automatically configured.
5. Press **esc** when the *Basic System* menu appears.
6. Select *Save Setup* → *To System*.
7. Reboot the device.
8. From the *Main Menu*, select *System Setup* → *Basic System* → *PS/2 Port Select* → *Card Reader Configuration* → *Automatic* → *Return*.

   The following message is displayed:

   Slide the Configuration Card
9. Slide the configuration card through the card reader.

   The *Manual Card Reader Configuration* window appears with numbers entered for the various configuration items.
10. Press **esc** twice.
11. Select *Save Setup* → *To system*.

Manual Configuration of Card Reader

1. With the card reader properly mounted, connect it to the **A** port on the back of the MAC 5000.
2. From the *Main Menu*, select *System Setup* → *Basic System* → *PS/2 Port Select* → *PS/2 Port Device* → *Card Reader* → *Return*.

   The *Manual Card Reader Configuration* window is displayed.
3. Enter the magnetic card code configuration information in this window. See "Creating Bar Codes and Magnetic Cards" on page 14-34.
4. Press **esc** twice.
5. Select *Save Setup* → *To system*.

Bar Code Reader Option Setup

NOTE

When configured for bar code reader, the system will prompt you to *Scan the patient ID bar code* when you select *Patient Information*. If no bar code is available, press **esc** to enter the patient information manually.

Do not use the bar code reader for scanning the bar code that appears on the ECG printout. The bar code on ECG printout is of a different format and not readable by the bar code reader.

Automatic Configuration of Bar Code

1. Obtain a configuration bar code. For details on creating a configuration bar code, see "Creating Bar Codes and Magnetic Cards" on page 14-34.
2. Connect to the bar code reader to the **A** port on the back of the MAC 5000.
3. From the *Main Menu*, select *System Setup* → *Basic System* → *PS/2 Port Select* → *PS/2 Port Device* → *Bar Code Reader* → *Return*.
4. Press **esc** when the *Manual Bar Code Configuration* window appears. The items in this window will be automatically configured.
5. Press **esc** when the *Basic System* menu appears.
6. Select *Save Setup* → *To System*.
7. Reboot the device.
8. From the *Main Menu*, select *System Setup* → *Basic System* → *PS/2 Port Select* → *Bar Code Configuration* → *Automatic* → *Return*.

   The following message is displayed:

   Scan the Configuration Bar Code
9. Scan the configuration bar code.

   The *Manual Bar Code Configuration* window appears with numbers entered for the various configuration items.
10. Press **esc** twice.

11. Select *Save Setup* → *To system*.

Manual Configuration of Bar Code Reader

1. Connect the bar code reader to the **A** port on the back of the MAC 5000.
2. From the *Main Menu*, select *System Setup* → *Basic System* → *PS/2 Port Select* → *PS/2 Port Device* → *Bar Code Reader* → *Return*.

   The *Manual Bar Code Configuration* window is displayed.
3. Enter the bar code configuration information in this window. See "Creating Bar Codes and Magnetic Cards" on page 14-34.
4. Press **esc** twice.
5. Select *Save Setup* → *To system*.

Creating Bar Codes and Magnetic Cards

The bar code reader can read Code 39, 39EX, and PDF-417 (2-D) bar codes.

The card reader can read magnetic cards which adhere to ISO 7810 and 7811.

Use the following rules to set up a scheme including patient demographic data in bar codes or magnetic cards.

Item	Byte Length
Patient ID	[1]16 (maximum)
Last Name	16 (maximum)
First Name	10 (maximum)
Year of birth	4
Month of birth	2
Day of birth	2
Gender	1

1. The *Patient ID* length should not exceed the 16-character maximum and should be equal to the ID length which is set up on the MAC 5000 in the *Patient Questions* window. This should also be compatible with the patient ID length for the MUSE CV system to which the MAC 5000 device is communicating.

Once a scheme has been determined, the following information must be provided to the MAC 5000 to properly set up the bar code reader or the card reader.

Total number of bytes _____

Patient ID offset _____

Patient ID length _____

First name offset _____

First name length _____

Last name offset _____

Last name length _____

Year of birth offset _____

Year of birth length _____

Month of birth offset _____

Month of birth length _____

Day of birth offset _____

Day of birth length _____

Gender offset _____

Gender length _____

Get order from MUSE	Select *Yes* to get orders from the MUSE. MAC 5000 will call MUSE. If an order for the PID exists on the MUSE system, the patient's information will display after reading the bar code or card. PID must be included in bar code or magnetic strip for this feature to function properly. If a message appears indicating there are multiple orders for this PID, you must use the *Order Manager* feature to select the order.

If you are using the automatic configuration feature, use the following information to create a configuration bar code or card.

Item	Character used to reserve byte space
Patient ID	9
First name	5
Last name	6
Year of birth	3
Month of birth	1
Day of birth	2
Gender	F

NOTE

All data resides in fixed width fields. The bar code or card generator must be programmed to add "trailing spaces" after patient names shorter than the fixed width of the patient names being used by your system.

Master's Step Setup (Option)

Within the system setup function, select *Master's Step* to define the parameters for the Master's Step option.

Master's Step Setup (Option)	
Item	**Description**
Number of Steps	The number of steps required during the exercise portion of the test. This is calculated from the patient weight, sex and age, but can be changed here.
Test Type	Test length. Select *Single* for 1.5 minute test, *Double* for 3 minute test or *Triple* for a 4.5 minute test.
Post J(ms)	Number of ms after J point used to determine the ST level.
Step Counter Display	Select *Up* to display steps taken so far. Select *Down* to display steps to go during exercise.
Continuous Recording	Continuously prints rhythm between post exercise ECGs.
Post Exercise ECG Time	The time, in minutes, after the 1st post exercise ECG when a additional ECG should be taken (up to 9 are available). Set any undesired tests to 0.

Miscellaneous Setup

Print Setup

Within the system setup function, select *Print Setup* to to print a report of your system's *System Setup* parameters.

Save Setup

Select *Save Setup* to save the changes you made to the *System Setup*.

Restore Setup

Select *Restore Setup* to change your system's *System Setup* parameters.

Restore Setup	
Item	**Description**
Restore Setup	Choose the method for changing all of your *System Setup* parameters. Select *To Original Factory Settings* to restore the system to the default GE Medical Systems *Information Technologies* settings. Select *From diskette* to install *System Setup* parameters stored on a disk. Select *Do Not Restore Setup* to exit this function.

A Appendix A – Maintenance

For your notes

General

WARNING

Maintenance— Failure on the part of all responsible individuals, hospitals or institutions, employing the use of this device, to implement the recommended maintenance schedule may cause equipment failure and possible health hazards. The manufacturer does not in any manner, assume the responsibility for performing the recommended maintenance schedule, unless an Equipment Maintenance Agreement exists. The sole responsibility rests with the individuals, hospitals, or institutions utilizing the device.

NOTE

Regular maintenance, irrespective of usage, is essential to ensure that the equipment will always be functional when required.

See the documentation provided with your peripheral equipment for appropriate maintenance procedures.

Inspecting and Cleaning

Precautions

- Turn off the system before inspecting or cleaning.
- Do NOT immerse any part of the equipment in water.
- Do NOT use organic solvents, ammonia based solutions, or abrasive cleaning agents which may damage equipment surfaces.

Visual Inspection

Perform a visual inspection of all equipment and peripheral devices daily. If you notice any items that need repair, contact an authorized service person to make the repairs.

- Check the case and display screen for cracks or other damage.
- Regularly inspect all plugs, cords, cables, and connectors for fraying or other damage.
- Verify that all cords and connectors are securely seated.
- Inspect keys and controls for proper operation.
- Toggle keys should not stick in one position.
- Knobs should rotate fully in both directions.

Cleaning

Exterior Surfaces

Clean the exterior surfaces of all equipment and peripheral devices monthly, or more frequently if needed.

1. Use a clean, soft cloth and a mild dishwashing detergent diluted in water.
2. Wring the excess water from the cloth. Do NOT drip water or any liquid on the writer assembly, and avoid contact with open vents, plugs, or connectors.

3. Dry the surfaces with a clean cloth or paper towel.

Disk Drive

Clean the disk drive every six months, or more frequently if you have data storage problems.

Use the head cleaning kit: PN 407546-001.

NOTE
Do NOT use cleaning solutions or solvents on the disks. Data loss or disk drive failure could result.

1. Power on the system.
2. Follow the head cleaning kit instructions to prepare the head cleaning disk.
3. Insert the head cleaning disk into the drive slot and note how long the drive spins.

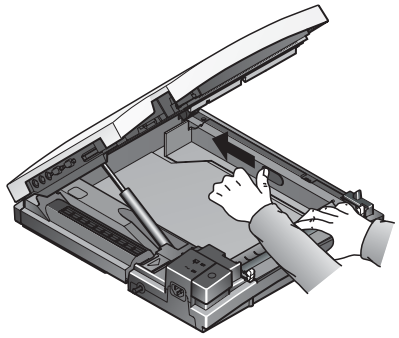
   The head cleaner disk must spin for a total of 30 seconds to clean the drive.
4. Repeat steps 1-3 until the head cleaning disk spins for 30 seconds or more.
5. Eject the head cleaning disk from the drive slot.

Paper

Changing the Paper Tray Size

Change to A4 Paper Size

Slide the paper guide toward the rear of the device to accommodate A4 size paper.



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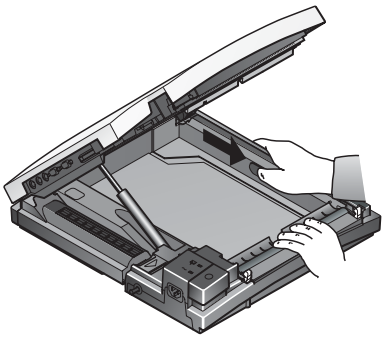
Change to Standard Paper Size

Slide the paper guide toward the front of the device to accommodate standard size paper.



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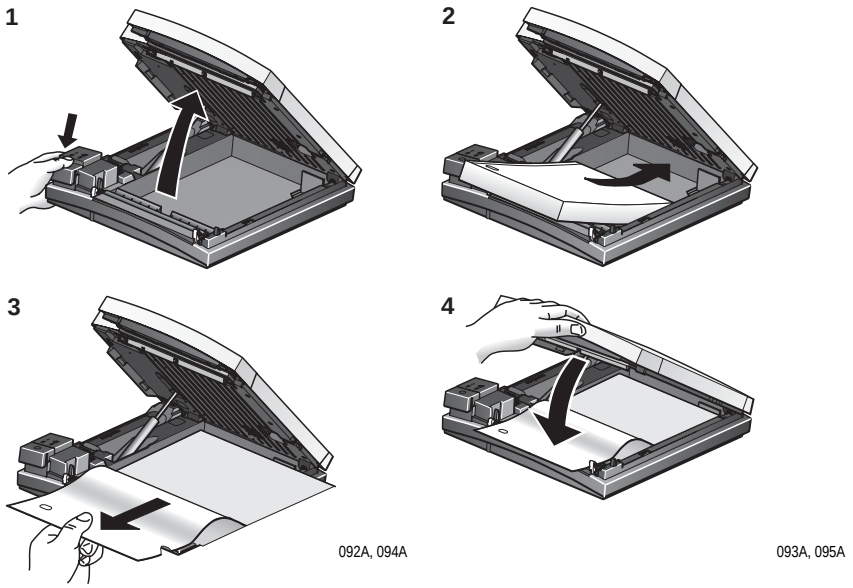
Replacing Paper



1. Open the unit.
2. Place the pad of paper so the holes are on the left side.
3. Advance the first sheet of paper.
4. Close the unit's lid securely.

Storing Paper

Thermal Paper

To avoid deterioration or fading of traces follow these precautions.

1. Store in cool, dark, and dry locations. Temperature must be below 80°F (27°C). Relative humidity must be between 40% and 65%.
2. Avoid exposure to bright light or ultraviolet sources such as sunlight, fluorescent, and similar lighting which causes yellowing of paper and fading of tracings.
3. Do NOT store thermal papers with any of the following:

- carbon and carbonless forms.

- non-thermal chart papers or any other products containing tributyl phosphate, dibutyl phthalate, or any other organic solvents. Many medical and industrial charts contain these chemicals.
- document protectors, envelopes, and sheet separators containing polyvinyl chloride or other vinyl chlorides.

1. Avoid contact with: cleaning fluids and solvents such as alcohols, ketones, esters, ether, etc.
2. Do NOT use: mounting forms, pressure-sensitive tapes, or labels containing solvent-based adhesives.

To assure maximum image life, thermal paper should be stored separately in:

- manila folders
- polyester or polyimide protectors.

Plastic document protectors, envelopes, or sheet separators made of polystyrene, polypropylene, or polyethylene will not degrade thermal traces in themselves. However, these materials afford no protection against fading from external causes.

Use only mounting forms and pressure-sensitive tapes made with starch or water-based adhesives.

NOTE

Paper manufacturers advise that these thermal products should retain their traces when properly imaged and stored for about 3 - 5 years. If your retention requirements exceed these guidelines, we recommend you consider alternate image storage techniques.

Archivist Paper

The following applies to Archivist thermal paper only.

GE Medical Systems *Information Technologies* warrants that the image produced on Archivist papers by GE Medical Systems *Information Technologies* equipment will not fade for seven (7) years when handled according to the instructions outlined below:

Archivist papers must be continuously stored below 104°F (40°C) and relative humidity must be maintained between 40% and 60%.

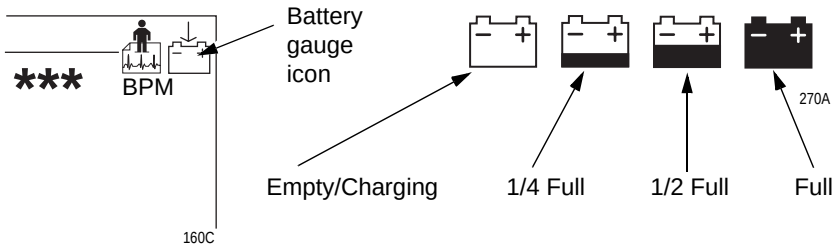
The customer must notify GE Medical Systems *Information Technologies* promptly following any customer knowledge of fading.

The GE Medical Systems *Information Technologies* equipment used shall have periodic maintenance performed in accordance with GE Medical Systems *Information Technologies* service manuals and/or technical memorandums.

Maintaining the Battery

Battery Gauge Icon

The battery gauge icon appears in the upper right corner of the active screen display. The battery gauge tells you how much charge your system's battery has available and when the system is charging the battery.



Charging the Battery

To Fully Charge the Battery

1. Power off the system.
2. Connect the system to an AC wall outlet.
3. Charge the system's battery 4-5 hours or until the battery gauge icon indicates a full charge.

When Should You Charge the Battery?

Before Initial Use

To ensure a fully charged battery, charge the system before you use it for the first time.

Between Acquisitions

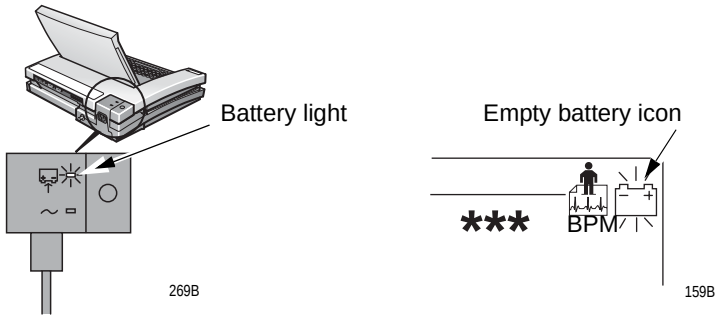
To ensure a fully charged battery, power off the system and connect it to an AC wall outlet until you use the system again. This prolongs battery runtime.

When the Battery is Low

The amber battery light and the “empty” battery gauge icon flash intermittently.

NOTE

The system may run for a long period of time after the “empty” battery icon appears.



When the Battery is Completely Discharged

Your system powers off when the battery is completely discharged. To operate your system, you must connect the system to an AC wall outlet.

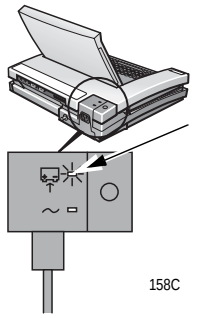
Is the Battery Charging?

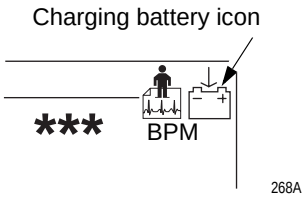
NOTE

If the battery is fully charged or exceeds safe charging temperature, the system will not charge the battery.

The system's battery is charging when:

- the amber battery light glows, and
- the battery gauge icon shows the battery charging icon.





Periodic Maintenance

In addition to normal system use, periodic deep discharge cycles may be required to ensure consistent battery performance.

A deep discharge cycle occurs when the battery is discharged until the system shuts down and the battery is charged until it is full.

NOTE

GE Medical Systems *Information Technologies* recommends one deep discharge cycle once every three months, but does not recommend over-exercising the battery with multiple deep discharge cycles. See the MAC 5000 Service Manual for more battery maintenance and diagnostic information.

Replacing the Battery

To prevent loss of data, save all patient data to a disk. Remove the AC power cable from the AC wall outlet and power off the system before removing the battery. After removing and replacing the battery, the battery gauge symbol resets to empty. Connect your system to an AC wall outlet to ensure a fully charged battery.

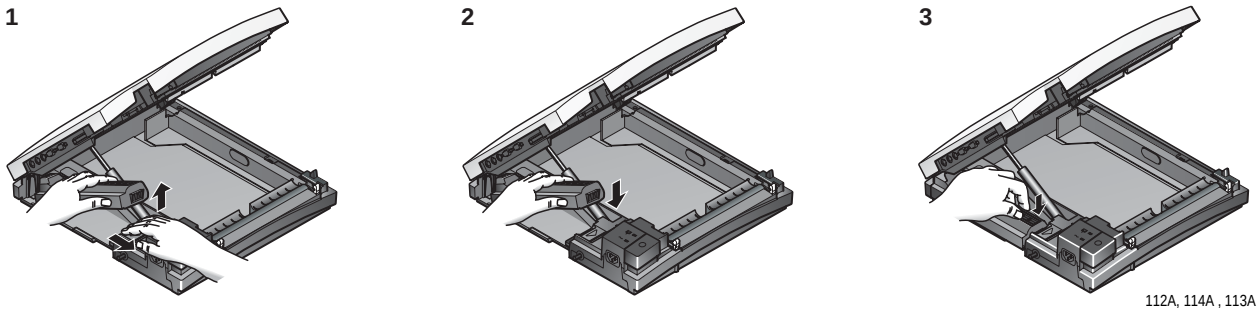
WARNING

Battery Pack Disposal— Do NOT dispose of the battery pack by fire or burning.

Follow local environmental guidelines concerning disposal and recycling.

NOTE

If battery fluid contacts your skin, eyes, or clothing, immediately wash the area with clean water and see a doctor.



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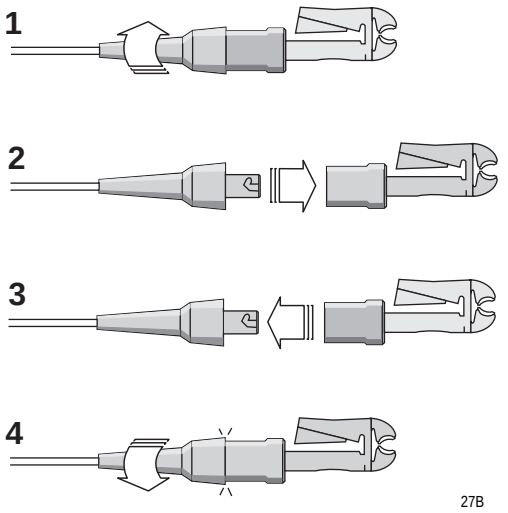
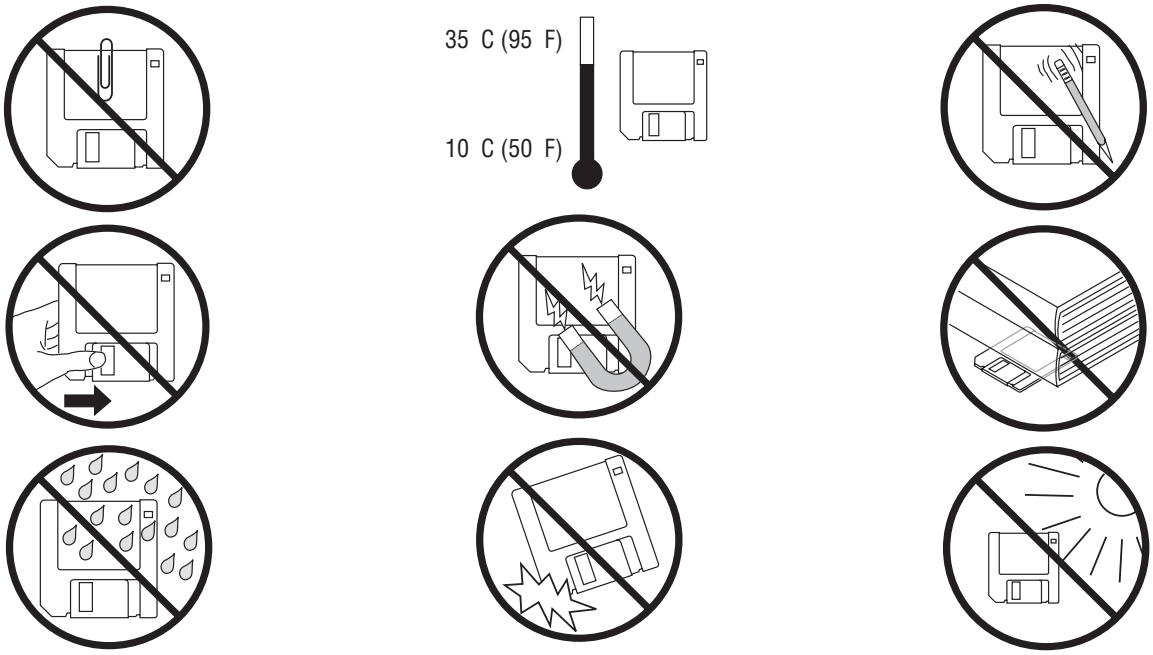
Replacing Acquisition Module Leadwire Adapters



Handling a Disk



001Adisk, 002Adisk, 003Adisk, 004Adisk, 005Adisk, 006Adisk, 007Adisk, 008Adisk, 009Adisk

B Appendix B – Troubleshooting

For your notes

Introduction

First Things to Ask

If the system is not working properly, save yourself some time troubleshooting by asking yourself these basic questions.

- Is the unit turned on?
- Have there been any changes in the use, location, or environment of the equipment that could cause the failure?
- Has the equipment's hardware or software been modified?
- Is operator error the cause of the problem? Try to repeat the scenario exactly and compare that to the proper operation of the equipment described in the manual.
- Is the battery installed?
- When connected to an AC wall outlet, does the green AC power light glow?
- Is the writer door closed?
- Is the software card installed?

Visual Inspection

A thorough visual inspection of the equipment can save time. Items such as disconnected cables or missing hardware can frequently cause symptoms and equipment failures that may appear to be unrelated and difficult to track.

For additional information, see Appendix A, "Appendix A –Maintenance" .

Equipment Problems

Reducing ECG Data Noise

If the acquired ECG data displays unacceptable noise levels:

- Verify proper electrode placement.
- Verify proper electrode application. Perspiration, excessive hair, lotions, and dead skin cells must be removed from the electrode site.
- Check for defective or date expired electrodes.
- Check for defective, broken, or disconnected leadwires.
- Check the patient's position. The patient should remain motionless during the acquisition of a resting ECG.

Refer to Chapter 3, "Preparing the Patient" for more information.

There is No ACI-TIPI Report

- ACI-TIPI is disabled.

  Enable ACI-TIPI.

  The selected report is *without interpretation*. Select *Interpretation* for the report.

- The ACI-TIPI required information is not entered.

  Make sure the age range, gender, and chest pain complaints are entered.

- The patient was entered as pediatric.

  Make sure you enter an age greater than 16.

- The original ECG was acquired in an electrocardiograph without the ACI-TIPI option.

Refer to "Using ACI-TIPI (Option)" on page 5-9 for more information.

No BP Readings from External Device

- Check the blood pressure device setup.

If Suntech, check protocol on Tango.

- Check cables (Serial and TTL).
- Check TTL trigger.

  Refer to “Inputs / Outputs” on page 14-28 for more information.

Treadmill / Ergometer Does Not Move

- Check protocol.
- Check cables.
- Check input / output settings.
- Check Emergency Stop switch to make sure it is not depressed or that it still retains settings from the previous patient.

  Refer to “Inputs / Outputs” on page 14-28 for more information.

System Errors

The following errors may occur while you are operating this system. You may be required to perform some action.

If you perform the recommended actions and the condition still remains, contact authorized service personnel. See "How to Reach Us" to find out how to contact GE Medical Systems *Information Technologies*.

Problem	Cause	Solution
appears on the screen.	No battery is installed in the system.	Install a battery and connect the system to an AC wall outlet to charge the battery.
flashes intermittently.	The battery charge is low.	Connect the system to an AC wall outlet to charge the battery.
appears on the screen.	The writer door is open.	Close the writer door.
The system does not power up when operating from battery power.	The battery is fully discharged.	Connect the system to an AC wall outlet to charge the battery.
The system shuts down when operating from battery power.	Battery is empty, or the *Automatic Shutdown* feature is enabled.	Connect the system to an AC wall outlet to charge the battery, or power on the system.
"__" Lead disconnected message appears.	Electrode(s) disconnected.	Reconnect the electrode(s).
MODEM ERROR. The remote device is not responding. Would you like to retry?	Modem not connected. (If wireless option, client bridge not connected or device is out of range.)	Connect and retry, or move back into range.
	(Wireless option only) MAC 5000 is not within range of access point.	Relocate MAC 5000 to within range of access point and retry transmission.
Cannot use the system because *Device Password* does not work.	Device Password has been changed or has not been adequately communicated to the staff.	Contact your administrator for *Device Password*.

C Appendix C – Editing Acronyms

For your notes

Resting ECG Acronyms

NOTE

The statements preceded by "#" do not appear on ECG reports when the *Screening criteria* item is enabled in *System Setup*. To enable or disable *Screening criteria*, see "ECG Analysis" on page 14-16.

	Statement	Acronym
#	Aberant conduction	ABCOND
	Abnormal ECG	AB
	Abnormal left axis deviation	ALAD
#	Abnormal QRS-T angle, consider primary T wave abnormality	QRST
	Abnormal right axis deviation	ARAD
	Abnormal right superior axis deviation	RSAD
	Accelerated	ACCEL
	Acute pericarditis	PCARD
	** ACUTE MI **	ACUMI
	, age undetermined	AU
	, and consecutive	CSEC
	and	AND
	Anterior infarct	AMI
	Anterior injury pattern	AINJ
	Anterior leads	ANT
	Anterolateral infarct	ALMI
	Anterolateral injury pattern	ALINJ
	Anterolateral leads	ANTLAT
	Anteroseptal infarct	ASMI
	Anteroseptal leads	ANTSEP

	Statement	Acronym
	Anteroseptal injury pattern	ASINJ
	Atrial fibrillation	AFIB
	Atrial flutter	FLUT
	(Atrial rate=	ARAT
	Atrial tachycardia	ATAC
	AV sequential or dual chamber electronic pacemaker	AVPCK
	Biatrial enlargement	BAE
	*** Bifascicular block***	BIFB
	Biventricular hypertrophy	BIVH
	Blocked	BLKED
	Borderline ECG	BORDE
	Borderline	BO
#	Cannot rule out	CRO
	Clockwise rotation of the heart, may invalidate criteria for ventricular hypertrophy	CWRT
	Coarse	CRS
	Counterclockwise rotation of the heart, may invalidate criteria for v. hypertrophy	CCWRT
#	Deep Q wave in lead V6,	QV6
	Demand pacemaker; interpretation is based on intrinsic rhythm	DPCK
	Dextrocardia	DXTRO
#	Early repolarization	REPOL
	Electronic atrial pacemaker	APCK
	Electronic ventricular pacemaker	PCK
	Fusion complexes	FUS
	in a pattern of bigeminy	BIGEM
	Incomplete left bundle branch block	ILBBB
#	Incomplete right bundle branch block	IRBBB

	Statement	Acronym
	Increased R/S ratio in V1, consider early transition or posterior infarct	QESPMI
	Idioventricular rhythm	IVR
	Indeterminate axis	INDAX
	Inferior infarct	IMI
	Inferior injury pattern	IINJ
	Inferior leads	INF
	Inferior-posterior infarct	IPMI
	Inferolateral leads	IFLAT
	Inferolateral injury pattern	ILINJ
	Inferoposterior leads	INFPOS
	Irregular	IRR
	Junctional bradycardia	JUNBRAD
	Junctional rhythm	JUNCTR
#	Junctional ST depression, probably abnormal	JST
#	Junctional ST depression, probably normal	JSTN
	Large	LARG
	Lateral infarct	LMI
	Lateral injury pattern	LINJ
	Lateral leads	LAT
	Left anterior fascicular block	AFB
	Left atrial bradycardia	LABRAD
	Left atrial enlargement	LAE
	Left atrial rhythm	LAR
	Left atrial tachycardia	LATACH
	Left axis deviation	LAD3
	Left bundle branch block	LBBB

	Statement	Acronym
	Left posterior fascicular block	PFB
	Left ventricular hypertrophy	LVH2
	Leftward axis	LAD
	** Less than 4 QRS complexes detected, no interpretation possible **	ANLERR3
	Low right atrial bradycardia	RABRAD
	Low right atrial rhythm	RAR
	Low right atrial tachycardia	RATACH
	Low voltage QRS	LOWV
	Marked sinus bradycardia	MSBRAD
	Marked ST abnormality, possible anterior subendocardial injury	ASBINJ
	Marked ST abnormality, possible anterolateral subendocardial injury	MSTDAL
	Marked ST abnormality, possible anteroseptal subendocardial injury	MSTDAS
	Marked ST abnormality, possible inferior subendocardial injury	ISBINJ
	Marked ST abnormality, possible inferolateral subendocardial injury	MSTDIL
	Marked ST abnormality, possible lateral subendocardial injury	LSBINJ
	Marked ST abnormality, possible septal subendocardial injury	SSBINJ
	Marked T wave abnormality, consider anterior ischemia	MAT
	Marked T wave abnormality, consider anterolateral ischemia	MALT
	Marked T wave abnormality, consider inferior ischemia	MIT
	Marked T wave abnormality, consider inferolateral ischemia	MILT
	Marked T wave abnormality, consider lateral ischemia	MLT
#	(masked by fascicular block?)	MAFB
	, maybe secondary to QRS abnormality	SNDQA
	** Memory allocation failure, no ECG interpretation possible **	ANLERR1
#	Minimal voltage criteria for LVH, may be normal variant	QRSV
#	Moderate voltage criteria for LVH, may be normal variant	LVH3

	Statement	Acronym
	moderate	MOD
	Narrow QRS tachycardia	NQTACH
	(No P- waves found)	NOPF
	** No QRS complexes found, no ECG analysis possible **	ANLERR2
	Nonspecific intraventricular block	IVCB
#	Nonspecific intraventricular conduction delay	IVCD
	Nonspecific ST abnormality	NST
	Nonspecific ST and T wave abnormality	NSTT
	Nonspecific T wave abnormality	NT
	Normal ECG	NML
	Normal sinus rhythm	NSR
#	Northwest axis	NWA
	or	OR
	or digitalis effect	ODIG
	Otherwise normal ECG	ABR
	*** Pediatric ECG anlaysis ***	PEDANL
#	, plus right ventricular enlargement	RVE+
	*** Poor data quality, interpretation may be adversely affected	QCERR
#	Possible	PO
	, possibly acute	AC
	Posterior infarct	POSTMI
	Posterior leads	POS
	premature atrial complexes	PAC
	premature ectopic complexes	PEC
	premature junctional complexes	PJC
	premature supraventricular complexes	PSVC

	Statement	Acronym
	premature ventricular and fusion complexes	PVCF
	premature ventricular complexes	PVC
	, probably digitalis effect	PDIG
	Prolonged QT	LNGQT
	Prominent lateral voltage	PLV
#	Prominent mid-precordial voltage,	PMDPV
	Prominent posterior voltage	PPV
#	Pulmonary disease pattern	PULD
	*** QRS contour suggests infarct size is probably	MISIZ
	Right atrial enlargement	RAE
#	Right axis deviation	RAD4
	Right bundle branch block -or-right ventricular hypertrophy	RBBRVH
	Right bundle branch block	RBBB
#	Right superior axis deviation	RAD5
	Right ventricular hypertrophy	RVH
#	Rightward axis	RAD
#	RSR' or QR pattern in V1 suggests right ventricular conduction delay	RSR
#	S1-S2-S3 pattern, consider pulmonary disease, RVH, or normal variant	S1S2S3
	Septal infarct	SMI
	Septal injury pattern	SINJ
	Septal leads	SEP
	Sinus/Atrial capture	CAPUR
	Sinus bradycardia	SBRAD
	Sinus rhythm	SRTH
	Sinus tachycardia	STACH
	Small	SMA

	Statement	Acronym
	ST &	ST&
	ST abnormality and	STABAND
	ST abnormality, possible digitalis effect	STDIG
	ST depression in	STDPIN
	ST depression, consider subendocardial injury or digitalis effect	STDEP
	ST elevation consider anterior injury or acute infarct	AIOHAI
	ST elevation consider anterolateral injury or acute infarct	ALIHAI
	ST elevation consider inferior injury or acute infarct	IIOHAI
	ST elevation consider inferolateral injury or acute infarct	ILIHAI
	ST elevation consider lateral injury or acute infarct	LIOHAI
	ST elevation in	STELIN
#	ST elevation, consider early repolarization, pericarditis, or injury	SERYR1
#	ST elevation, probably due to early repolarization	SERYR2
	ST elevation, consider injury or variant associated with LVH	INJONV
	Statement not found	SNF
	Supraventricular tachycardia	SVT
	*** Suspect arm lead reversal, interpretation assumes no reversal	ARM
	T wave abnormality, consider anterior ischemia	AT
	T wave abnormality, consider anterolateral ischemia	ALT
	T wave abnormality, consider inferior ischemia	IT
	T wave abnormality, consider inferolateral ischemia	ILT
	T wave abnormality, consider lateral ischemia	LT
	T wave inversion in	TINVIN
	Undetermined rhythm	UR
	Unusual P axis and short PR, probable junctional bradycardia	JBRAD
	Unusual P axis and short PR, probable junctional rhythm	JR

	Statement	Acronym
	Unusual P axis and short PR, probable junctional tachycardia	JTACH
	Unusual P axis, possible ectopic atrial bradycardia	EABRAD
	Unusual P axis, possible ectopic atrial rhythm	EAR
	Unusual P axis, possible ectopic atrial tachycardia	EATACH
	Ventricular pre-excitation, WPW pattern type A	WPWA
	Ventricular fibrillation	VFIB
	Ventricular tachycardia	VTACH
	Ventricular pre-excitation, WPW pattern type B	WPWB
	very large	VLAR
	very small	VSMA
	Voltage criteria for left ventricular hypertrophy	LVH
	with	WITH
	Wide QRS rhythm	WQR
	Wide QRS tachycardia	WQTACH
	with 1st degree AV block	FAV
#	with 2:1 AV conduction	W2T1
	with 2nd degree AV block (Mobitz I)	MBZI
	with 2nd degree AV block (Mobitz II)	MBZII
	with 2nd degree AV block	SAV
	with 2nd degree SA block (Mobitz I)	SABI
	with 2nd degree SA block (Mobitz II)	SABII
#	with 3:1 AV conduction	W3T1
#	with 4:1 AV conduction	W4T1
#	with 5:1 AV conduction	W5T1
#	with a competing junctional pacemaker	CJP
	with AV dissociation	AVDIS

	Statement	Acronym
	with complete heart block	CHB
	with frequent	FREQ
	with fusion or intermittent ventricular pre-excitation (WPW)	ALTWPW
	with junctional escape complexes	JESC
	with marked sinus arrhythmia	MSAR
	with occasional	OCC
	with premature aberantly conducted complexes	ABER
	, with posterior extension	PXT
	with QRS widening and repolarization abnormality	QRSW-2ST
	with QRS widening	QRSW
#	with rapid ventricular response	RVR
#	with retrograde conduction	RETC
	with repolarization abnormality	2ST
	with short PR	SPR
	with sinus arrhythmia	SAR
	with sinus pause	PAUSE
#	with slow ventricular response	SVR
	with strain pattern	WSTR
#	with undetermined rhythm irregularity	IRREG
	with variable AV block	VAVB
	with ventricular escape complexes	VESC
	Wolffe-Parkinson-White	WPW

D Appendix D – Report Formats

For your notes

Format Description

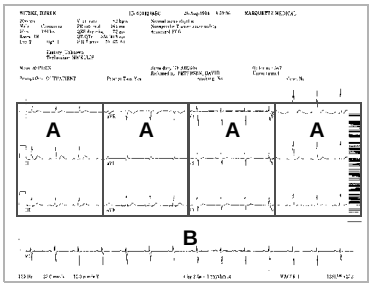
Numeric report names are used to describe how the ECG data is displayed.

4 by 2.5s + 1 rhythm ld

A B

4 by 2.5s + 1 Rhythm Lead Format

	Description
A	Four columns of data containing 3 leads with 2.5 seconds of data in each lead.
B	One 10 second rhythm lead.



147A

The following reports also use numeric names:

- 2 by 5
- 2. 5s @ 50 mm/s (writer speed)
- 2 by 5s + 1 rhythm lead
- 2 by 10s
- 3 by 5 @ 50mm/s
- 3 by 10s
- 4 by 2.5s
- 4 by 2.5s + 1 rhythm lead

- 4 by 2.5s + 3 rhythm leads
- 4 by 10s
- 5 by 2s
- 5 by 2s + 1 rhythm lead
- 5 by 2s + 3 rhythm leads
- 5 by 10s

Key to Bottom of Exercise Reports

The following report codes are printed on the lower left edge of the Exercise Report and have the following meaning:

A+	Auto Arrythmia Reporting is ON.
A-	Auto Arrythmia Reporting is OFF.
H+	Stag Hold is ON.
H-	Stag Hold is OFF.
S+	Cubic Spline is ON.
S-	Cubic Spline is OFF.
50	50Hz AC filter is ON.
60	60Hz AC filter is ON.
HR	Binary encoded format for heart rate leads.

Additional Report Names

Report Name	Description
12 Rhythm Leads	10 seconds of 12-lead rhythm.
Autorhythm	10 seconds of 3, 6, or 12 leads of rhythm.
CGR	One median complex for each of the 12 leads combined with 10 seconds of 3-lead rhythm.
Expanded Median	Each median complex can be expanded by double the speed and double the gain.

Report Name	Description
Linked Median	A 4 x 2.5 with 1 rhythm lead format. The rhythm lead printed across the bottom of the report is the first lead of the 'Swedish format rhythm leads' group that is configured in Exercise Setups (Report Leads).
Medians and Rhythm	A median complex for each of the standard 12 leads is displayed in the upper portion of this report. Below the medians are three rhythm strips. These rhythm leads are the first three leads of the 'Swedish format rhythm leads' group that is configured in Exercise Setups (Report Leads).
6 Lead Comparative Medians and Rhythm	The baseline and current medians are compared side-by-side and followed by real-time waveforms. The 6 leads used by this report are the 'Swedish format rhythm leads' group that is configured in Exercise Setups (Report Leads).
12 Lead Comparative Medians and Rhythm	A one-page report for which the baseline and current medians are compared side-by-side and followed by 2.5 seconds of real-time rhythm for the standard 12 leads. ST level and ST slope are reported for each lead.
Hi-Res or PHi-Res Signal Averaged Template	Dominant (averaged) beat type.
Hi-Res or PHi-Res Signal Averaged Standard	Vector magnitudes of X,Y,Z.
Hi-Res or PHi-Res Signal Averaged Expanded	400mm/s of expanded X,Y,Z medians and a RMS voltage function/VM plot.
ACI-TIPI	The analysis of the acquired ECG data appears at the top of the report.
Hi-Res or PHi-Res Signal Overlapped	X,Y,Z data at two different amplitudes.
RMR	One median complex for each of the 12 leads combined with 10 seconds of 3-lead rhythm.
Swedish Format 1	One median complex for each of the 12 leads at writer speed of 50mm/s combined with 5 seconds of 6-lead rhythm at half writer speed. Text is on the bottom of the page.
Swedish Format 2	5 seconds for each of the 12 leads at writer speed 50mm/s. Text is on the top of the page.
Vector Loops	Sagittal, horizontal, and frontal plane vectorgrams. Marks on sample X,Y,Z complexes identify P onset and offset, Q onset and offset, and T onset.

In-Test Reports

Report Name	Description
12 or 15-Lead Report	Based on Exercise report setups, a variety of 12 or 15 Lead report formats will print without ECG analysis when the **12 ld** key is pressed or when 12/15 lead reports are configured in the protocol.
5 Second Rhythm Report	This report can be chosen from the Edit Protocol application to print at certain points during the test.
Rhythm Report	A continuous, real-time recording of raw data - 3, 6, 12 leads. Leads for rhythm report correspond to leads on the screen.
Arrhythmia Report	Automatic documentation of arrhythmias with 2.5 seconds of raw data prior to the ectopic beat. Leads of arrhythmia report correspond to leads on the screen.
Recall Report	A delayed recording of raw data 10 seconds in duration. Leads of recall report correspond to leads on the screen.
Median Report	Based on exercise setups, a Linked Median, Medians & Rhythms, 6 or 12 Lead Comparative Medians & Rhythm report will print. See the 'Additional Report Names' section for a description of these formats.

Exercise Final Report Names

Report Name	Description
Summary Report	One page overview of test with Resting and Max ST or peak median morphologies. For Maximal ST Depression, report only prints when a minimum of -.5 mm of ST depression occurs in one of the following leads. I, II, III, aVF, V2-V6. (V1, aVR, aVL excluded. For elevation, - aVR is excluded).
Tabular Report	Tabular summary of test by stage including time, speed, grade, workload, MET level, heart rate, blood pressure, RPP and comments.
Selected Medians Report	Records median morphologies at Baseline, Maximum ST Depression, Peak Exercise and Test End for 12 leads. For Maximum ST medians, column only prints when a minimum of -.5 mm of ST depression occurs in one of the following leads. I, II, III, aVF, V2-V6. (V1, aVR, aVL excluded. For elevation, - aVR is excluded).
Trends and Medians	Records a plot of the heart rate and blood pressure against time. Next to these trend graphs are channels of stored median data from the various stages of an exercise test.
Median Report	Records median morphologies for 3, 6 or 12 leads. The 3 and 6 lead reports are configured using the 'Swedish format rhythm leads' of the Exercise Setups (Report Leads). The 12 lead report uses the standard 12 lead set. The median storage intervals (also referred to as sample cardiac cycles) can be configured using the Median (First and Repeat) column of the Protocol Editor.

Report Name	Description
Trend Reports	Records plots of PVCs, heart rate and blood pressure. Also produces trend report of ST level and slope vs. time. The 3-lead trend report will use the first three leads of the 'Swedish format rhythm leads'.
ST/HR Loops Report	A two-dimensional representation of ST Level vs. Heart Rate.
ST/HR Slope Report	Records linear regression of heart rate-adjusted slope for all leads, plus median morphology of lead with highest slope.

E Appendix E – Master's Step Data

For your notes

Master's Step Table

The table below shows the number of steps to set according to the age, sex, and weight settings for the patient as they reside or are entered into the system.

Age		5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79
Weight (kg)	Sex															
18-22	Male Female	35 35	36 35	 33												
23-26	Male Female	33 33	35 33	32 32												
27-31	Male Female	31 31	33 32	31 30												
32-35	Male Female	28 28	32 30	30 29												
36-40	Male Female	26 26	30 28	29 28	29 28	29 28	28 27	27 26	27 24	26 23	25 22	25 21	24 21	23 20	23 19	22 18
41-44	Male Female	24 24	29 27	28 26	28 27	28 26	27 25	27 24	26 23	25 22	24 21	23 20	22 19	22 18	21 18	20 17
45-49	Male Female	22 22	27 25	27 25	28 26	28 26	27 25	26 24	25 23	25 22	24 21	23 20	22 19	22 18	21 18	20 17
50-53	Male Female	20 20	26 23	26 23	27 25	27 25	26 24	25 23	25 22	24 21	23 20	22 19	22 18	21 18	21 17	20 16
54-58	Male Female	18 18	24 22	25 22	26 24	27 24	26 23	25 22	24 21	23 20	22 19	22 18	21 18	21 17	20 16	19 15
59-63	Male Female	16 16	23 20	24 20	25 23	26 23	25 22	24 21	23 20	23 19	22 19	21 18	20 17	20 16	19 15	18 15
64-67	Male Female		21 18	23 19	24 22	25 22	24 21	24 20	23 19	22 19	21 18	20 17	20 16	19 15	18 15	18 14
68-72	Male Female		20 17	22 17	24 21	25 20	24 20	23 19	22 19	21 18	20 17	20 16	19 16	18 15	18 14	17 13

Age		5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79
Weight (kg)	Sex															
73-76	Male		18	21	23	24	23	22	22	21	20	19	18	18	17	17
	Female		15	16	20	19	19	18	18	17	16	16	15	14	13	12
77-81	Male			20	22	23	23	22	21	20	19	18	18	17	17	16
	Female		13	14	19	18	18	17	17	16	16	15	14	13	13	12
82-85	Male			19	21	23	22	21	20	19	19	18	17	16	16	15
	Female			13	18	17	17	17	16	16	15	14	14	13	12	11
86-90	Male			18	20	22	21	21	20	19	18	17	16	15	15	14
	Female			12	17	16	16	16	15	15	14	13	13	12	12	11
91-94	Male				19	21	21	20	19	18	17	16	16	15	14	14
	Female				16	15	15	15	14	14	13	13	12	11	11	10
94-99	Male				18	21	20	19	18	17	17	16	15	14	14	13
	Female				15	14	14	14	13	13	13	12	11	11	11	10
100-104	Male				17	20	20	19	18	17	16	15	14	13	13	12
	Female				14	13	13	13	13	12	12	11	11	10	10	09

ST-T Change

The existence of any ST-T change is assessed by classifying ST-T into three assessment levels: positive, borderline, and negative. The following criteria is used:

Positive

- ST depression ≥ 0.1mV (2 or more leads).
- ST elevation ≥ 0.2mV (2 or more leads).
- T wave change ≥ 1.0mV (2 or more leads).

One of these three criteria must be met.

Borderline

- ST depression ≥ 0.05mV (any leads).
- ST elevation ≥ 0.1mV (any leads).
- T wave change ≥ 0.5mV (any leads).

One of these three criteria must be met.

Negative

- Positive and borderline criteria are NOT satisfied.

Calculation

ST depression = (rest ST - post J) - (post exercise ST - post J)

ST elevation = (post exercise ST - post J) - (rest ST - post J)

T wave change = absolute value of (rest T wave amplitude - post-exercise T wave amplitude)

(ST - post J: amplitude at the post J point)

When the assessment is positive or borderline, the lead with the largest change prints.

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